

AVIATION WEEK

A MCGRAW-HILL
PUBLICATION

July 30, 1956

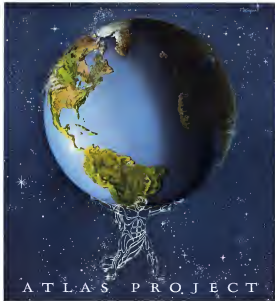
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Cartridge Devices
Used on Aircraft**



C-130*

CAB Analyses Mid-Air Collision Threat



Convair's Atlas...
a key to
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Convair's intercontinental ballistic missile, a vital weapon for our national security, is aptly named Atlas. As a deterrent to war—a force for world peace—it literally can sustain the future freedom of all mankind!

For ten years Convair's Engineering and the Air Force has led the way in the development of the atom. Today, Convair continues its leadership with the largest and most experienced organization in the aerospace field. **CONVAIR Aeronautics** is now building a complete facility in San Diego, California, to produce the Atlas... a key to ultimate peace!

CONVAIR
a division of General Motors Corporation

FAIRCHILD
F-27
Friendship



**The following airlines have ordered
Fairchild F-27 propjet transports:**

*Bonanza Air Lines Frontier Airlines Mackey Airlines
Piedmont Airlines West Coast Airlines*

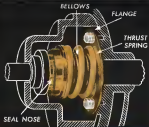
**These airlines will be serving 125 cities
starting in late 1957 and 1958**

The exciting new Fairchild F-27 is tailored to the needs of the airline operator... conceived for the comfort of the air traveler. Among its features are: Rolls-Royce Dart propjet engines, 260 mph cruising, 3250 mile range, 40 passengers, lowest operating costs, small field performance and

maneuverability. For the full F-27 story, for a preview of the effect of this new propjet transport on your airline or company operations, write to: R. James Pfeiffer, Executive Director of Customer Relations, Fairchild Engine and Airplane Corporation, Hagerstown 15, Maryland.

FAIRCHILD
F-27
Friendship

THE FINEST AIRCRAFT FOR AIRLINES,
CORPORATIONS AND MILITARY SERVICES



HOW TO LEAKPROOF SHAFTS AT HIGH TEMPERATURES

It makes no difference whether you expose them to a 300°F. deep freeze or a scorching 600°F. Fulton Sylphon relay bellows seals will still leakproof rotating shafts against corrosive, explosive or contaminating fluids and gases.

One reason is that this seal features a stainless, flexible metal bellows which expands, contracts and deflects to apply the proper sealing pressure at all times. Furthermore, the Fulton Sylphon bellows is made with silver solder for extra high-temperature protection.

You can obtain Fulton Sylphon bellows seals in rotating or stationary types for pressures up to hundreds of pounds and shaft speeds up to 20,000 RPM. For the steady energy and other industries, they're also available with welded construction to solve special contamination problems.

SEND FOR BULLETIN FA-27

V-FACE SEALS

Normally called hot seats, Fulton V-Face seals are designed to seal the air-fuel mixture in the combustion chamber of the engine. They are made of a special alloy and are designed to last for 10,000 hours.



Robertshaw-Fulton
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FULTON SYLPHON DIVISION • Kew-Ford 5, Tor., Ont.

AVIATION CALENDAR

July 28-Aug. 9-27th Annual U.S. National Young Engineers Convention, Cedar Rapids, Iowa, Grand Prairie Airport, Texas.
Aug. 1-4-San Francisco 1915 National Convention and Symposium, Sheraton Hotel, San Francisco, Calif.
Aug. 6-10-Society of Automotive Engineers Annual Meeting, West Coast Meeting, Sheraton Hotel, San Francisco, Calif.
Aug. 7-10-Air Transport Association Board and Executive Committee Meeting, Palmer Hotel, San Francisco, Calif.
Aug. 15-17-Exhibition of the Aeronautical Section, National Turbine-Powered Air Transportation Meeting, Grand Hotel, San Diego, Calif.
Aug. 27-29-Bi-Rite Aviation Supply 1915 International Ignition Conference, Seely, N.Y.
Aug. 27-29-Association for Computing Machinery, University of California West Coast Campus, Los Angeles.
Sept. 1-5-1915 National Aircraft Show, Chickadee City.
Sept. 3-7-Canadian National Air Show, Toronto, Canada.
Sept. 16-Society of British Aircraft Constructors 17th Annual Air Show, Royal Aircraft Establishment, Farnborough.
Sept. 9-11-International Northwest Aviation Council, 20th annual convention, Kona, Idaho.
Sept. 10-14-Venue Society of Mechanics and Engineers, International 6-Regulation Division Meeting, Detroit, Mich.
Sept. 16-22-German Society for Testing Materials, Second Pacific National Meeting and Appointments Exhibition, Basel, Switzerland.
Sept. 17-International Air Transport Association, 17th annual general meeting, Edinburgh, Scotland.
Sept. 17-21-Eleventh Annual Instrumentation Conference & Exhibit, sponsored by the Instrument Society of America, Columbia, New York, N.Y.
Sept. 17-22-International Congress of Aeronautics, sponsored by the International Aeronautical Federation, Rome, Italy.
Sept. 21-24-Intertec Society of Mechanical Engineers, European Conference, Hotel Statton, London, Eng.
Sept. 21-24-1915 Trade Fair of the Aeronautics Industry, New York, Chicago.

AVIATION WEEK • JULY 30, 1915

Published by the U.S. National Young Engineers Convention, Cedar Rapids, Iowa, Grand Prairie Airport, Texas. The convention is the largest of its kind in the world. It is a gathering of young engineers from all over the world. They are here to learn from each other and to share their knowledge. The convention is a great opportunity for young engineers to meet and talk with the leaders of the profession. They can learn about the latest developments in their field and about the career opportunities available. The convention is a great time to build friendships and to learn from the experience of others. It is a great time to be a part of something big and to make a difference in the world.

Phillips 66

PRESENTS

MILESTONES IN AVIATION

Bird Boy Art Smith

Whichever daring exploits of pioneer aviators are chronicled, the name of Bird Boy Art Smith is sure to appear. From the time he flew his first Curtiss-type biplane in 1911 until his death in 1935, Art Smith dedicated his life to aviation.

The romance of his life was heightened by the unselfish encouragement of his mother and father, who mortgaged their home so that their son could have the money to build his first airplane. Another inspiration of his early years was his sweetheart, Anne Court. They stayed in 1912 in what is considered to be the world's first airplane cloghouse.

Flying in such places as Deadwood, S. Dakota, and in the capital of Japan, Art Smith set the world record for looping the loop, pioneered sky writing and revealed dozens of bench-taking stunts to win acclaim of millions throughout the world.

The costume of daring aviators for Art Smith's flying by giving him a model started with a flight he made in the Black Hawk in 1912. One of his most prized awards was a gold sash, given him by his hero, Buffalo Bill.



Black Hawk, St. Louis, Mo. (left) and the first flight of the first airplane, 1903.

Black Hawk, St. Louis, Mo. (left) and the first flight of the first airplane, 1903.

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It's Performance that Counts!

A pioneer in research and manufacturing to meet aviation needs, Phillips Petroleum Company continues its leadership as a supplier of high octane gasoline and new super performance Jet fuels for today's aircraft.

Since aviation's early days, Phillips has taken an active part in meeting up higher standards for aviation fuel. In fact, Phillips pioneered in producing such important aviation components as HF Alkyline and Deisovipr.

In aircraft fuels, it's performance that counts. And military and commercial operators know their jet engine performance from Phillips Jet products.

AVIATION DIVISION
PHILLIPS PETROLEUM COMPANY
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Component Units: Waights: Receiver, A-E Box, Lens, 4.2 lbs.; Lens, Receiver, 7.5 lbs.; Control Unit, 1.6 lbs.; Indicator, 1.2 lbs.; Power Unit, 2.2 lbs. (All lbs. Certified)

Fly light and accurate... better than ever before!

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Now make more for more payload and other equipment. Fly with ARC-reliability, less weight, less space, less drag. Ask your dealer for complete details.

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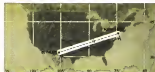


Aircraft Radio Corporation BOONTON, NEW JERSEY

Here's why BENDIX SELF-CONTAINED NAVIGATIONAL COMPUTERS can master aircraft navigation problems anywhere



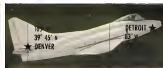
1 BOTH FIXED AND MOVING TARGETS. Bendix Self-Contained Navigational Computers will direct the course to any fixed target... or a lead collision course to any moving target... and will continuously indicate position with respect to north, destination, or point of interest.



2 RHO-THETA TYPE, IF DESIRED. Bendix experience is demonstrated and corrects all types of computer—rho-theta, for example—for any desired method of navigation. So Bendix are Bendix Computers that they can be built for almost any mode of navigation and at the operator's choice.

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3 ALSO LATITUDE-LONGITUDE TYPE. Another basic type of Bendix Computer from destination long coordinates. For rugged reliability, all designs are completely stress tested; presentation of information is by latest techniques, including outside ray pattern display.



4 FOR SHORT AND LONG RANGE. Effective operation of these self-contained Bendix units ranges from distances of less than 100 miles on up to 2000-mile flights. A big advantage of buying Bendix is that units can be tailored and packaged to meet any set of requirements.



5 GREAT-CIRCLE OR RHUMB-LINE NAVIGATION. Map-traces around the world, or over the poles, by great circle or rhumb line, can be handled with equal facility and accuracy. A design feature of Bendix Computers is compactness and light weight. Some weigh as little as 12 lbs.

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ACTUAL SIZE photograph. Characterizes the small size (length 18.25 inches) of this 75-pound, 30 KVA, Constant Frequency Power Package. This generator-drive generator isolates sensitive, 600-cycle output frequency over an input speed range of 1190 to 1306 rpm.

GENERAL ELECTRIC ANNOUNCES...

NEW CONSTANT FREQUENCY POWER PACKAGE

The constant frequency required for optimum performance of electronic equipment in modern aircraft is now possible with a single, compact unit. The new G-E generator-drive package combines the functions of the hydraulic ball piston constant speed drive and a statically excited generator into a self-contained unit, smaller and lighter than any conventional drive and generator combination of the same rating. In addition, this new generator has all the inherent safety and performance features of the G-E Hydraulic Con-

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Corporate aircraft stay on the job with Van Dusen service. This plane, owned by a large corporation, is an international traveler and a regular caller.

Van Dusen knows a good thing... and so does Shell

What a difference when a dealer "flies with Shell." For example, take the experience of Van Dusen Aircraft, Shell aviation dealer, at Logan International Airport, Boston.

As John Myers, Van Dusen manager, puts it, "Being a Shell Dealer means a lot in this business. You've got to have the right equipment and the right products because ground time is expensive and schedules must be met."



A private plane ready-to-roll—Van Dusen serviced.

"We're on top on both counts. With a full line of dependable Shell aviation products and the very latest Shell equipment, we can give every flier just what he wants—on-schedule service.

"Take the businessman who flies. Here in New England, the corporate aircraft market is expanding like sixty. Our service roster includes names like U. S. Steel and IBM because Shell has helped us know the needs of the corporate flier and we're equipped to give him top-notch service.

"Let me tell you how. Frequent visits from our Shell aviation specialist show us new ways to build the kind of service fliers want. We've got a direct pipeline right into all that Shell know-how. In addition, every issue of the Shell Dealer magazine gives us merchandising tips on better ramp service.



Manager John Myers, of Van Dusen Aircraft Supplies, explains his company's ground-base position in New England's aviation boom.



It takes the proper equipment to deliver the best word in aviation. The Shell fuel truck is decidedly as much at its best as any other.



As soon as you test up, Van Dusen is there with service.



Van Dusen refuels BOAC colours for trip to Europe.

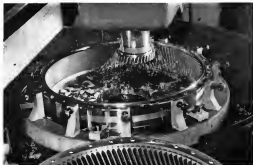
"Equally important, is the Shell Credit Card system. Every year we service hundreds of new customers who use Shell Credit Cards. It's another Shell service that really saves the flier lots of time and bother.

"And it's the same story with commercial airlines, too. Shell's experience and contacts are always available to help us get new business."

It pays to be a Shell Aviation Dealer
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This 7 pitch, 19.1564" pitch diameter internal gear for the Sikorsky S-55 Main Transmission

This HARD (Rockwell "50C") gear is cut after heat treating to master gear standards:

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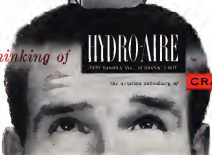
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G-E TURBOPUMPS ON THE B-52 are driven by air ducted from the jet engines. These units supply the hydraulic power necessary to operate the bomber's steering, egressage surfaces, landing gear, bomb bay doors, and wing spoilers.



G-E TURBODRIVES ON THE B-52 also operate on air ducted from the engines. These constant speed drives each turn a 50-hp, 180-cps alternator which produces electricity for the B-52's radio, lighting, armament, and control panels.

New General Electric Air-turbine Drives Save

The Boeing B-52 Stratofortress, newest Air Force jet bomber, uses General Electric turbopumps and turbodrives to help supply its hydraulic and electric power. Chalking up more than 100,000 hours operating time, these weight-saving power packs have helped to make the giant bomber one of the most advanced aircraft in the world today.

OPERATING ON THE SIMPLEST OF PRINCIPLES, G-E turbopumps and alternator drives consist only of

a turbine, gearing, and integral lubrication and control systems. Because their basic design requires very few moving parts, G-E turbopumps and drives are engineered to give long, dependable service under the most stringent operating conditions.

COMPACT AND SELF-CONTAINED, these units are located near the point where power is needed. Such versatility, remote location reduces "drag" by cutting engine nacelle size, and eliminates the weight of long

Weight, Permit Increased B-52 Performance

transmission lines. The lighter system weight obtained with G-E turbopumps and drives permits increased aircraft range, speed, or payload.

TOP RELIABILITY OF AIR-TURBINE DRIVES is achieved by cross-branching the plane's air supply ducts. Through this method, all drives aboard the aircraft can be operated on air from one or any combination of engines.

FOR DETAILED INFORMATION on how G-E turbopumps and turbodrives, manufactured by General Electric's Aircraft Auxiliary Turbine Department in Lynn, Mass., can answer the accessory power needs of your aircraft, contact your General Electric Aviation and Defense Industries Sales Office, or clip coupon for free descriptive bulletin.



THE B-52—first aircraft in history to use pneumatic-driven power equipment for operating its entire accessory system.

General Electric Co., Boston 230-F
Schenectady 5, N. Y.

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— new air traffic safety by Stewart-Warner Electronics

Now, the new Stewart-Warner Electronics Airborne Safety Beacon makes it possible for every plane in the air to carry identification as positive as your own fingerprints. Stewart-Warner Electronics, the pioneer and builder of the first airborne safety beacons, which were tested by the Air Navigation Development Board and CAA, now offers airline and other aircraft owners automatic identification for greater air traffic safety.

The new beacon combines all the reliability and long-life factors of airborne military equipment supplied by Stewart-Warner Electronics to the services since 1945. This rugged equipment incorporates AIRINC tubes and is designed to meet specifically characteristics No. 530-A.

CAA is now planning to install interceptors on ASR radar at all major air terminals to improve air safety. Be sure you take advantage of this program by installing an S-W Electronics Air Safety Beacon. Write today for full details from our Civil Aviation Department 14, Stewart-Warner Electronics, 1300 North Kostner Avenue, Chicago 51, Illinois.

SW ELECTRONICS
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North American F-100



Boeing B-47



North American F-100



North American F-100



Lockheed C-130



Boeing B-47



Boeing B-28



Douglas B-66



Douglas F-102



Boeing B-47



McDonnell F-101

These American aircraft all carry ducting components by Solar

LEADING TURBINE-POWERED aircraft use Solar-built ducting in their pneumatic systems. Designers of these planes depend on Solar's unique facilities for complete systems or individual assemblies to meet the most stringent specifications.

With the trend to more intricate ducting systems and to higher pressures and temperatures, the

tight safety requirements of these vital components becomes increasingly important. Solar is a completely integrated ducting source—all the way from design engineering through to comprehensive testing. Can Solar help you solve a ducting problem? Write Dept. C-30, Solar Aircraft Company, San Diego 12, California.



B.F. Goodrich



Blades that save pilots from close shaves with ice

There's no need to dread propeller ice when blades, cuffs and spoilers have complete protection like the Lockheed C-130 Hercules shown above. B. F. Goodrich electrical De-Icators are designed to give the required amount of heat on these vital propeller parts.

Rearranger wires are sand-wrapped between rubber gaskets to insure the desired heat transfer—without undue flexing, lightweight wires for connecting directly to metal surfaces.

B. F. Goodrich electrical propeller De-Icators fit skin tight around tricky

curves and creases—give added protection against eroding effects of salt, sand and dust.

If you are looking for one of the more efficient ways to provide spot heat—whether for ice protection or heat control—B. F. Goodrich electrical De-Icators and heaters are the answer. Successful applications include: antennas, engine, wing and empennage leading edges, oil lines, oil cell heaters, air heaters and radio equipment.

Perhaps these examples suggest a possible solution to your own ice or

temperature control problems. B. F. Goodrich engineers will be pleased to give you expert help. Aviation Products Division, The B. F. Goodrich Company, Akron, Ohio.



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EDITORIAL

Keep an Eye on Aeroflot

Soviet military aviation has sprung a series of surprises on a too many western world during the past three years. After a look at operations of Aeroflot, the Soviet's government-owned airline, and filling with some of its executives and aircraft designers in Moscow, we predict that the Russians will spring some new surprises in air transport on the West during the next five years.

Looking at Aeroflot operations today could be just as deceptive as watching the streams of jet-engineered Stormoviks, Yak fighters and Tu-4 bombers of the Boeing B-29 in the post-war period up to 1950. When the MIG-17 appeared in Korean combat in 1953 it upset most of the western world's concepts about the state of the art of Soviet jet aviation. Similarly the appearance of the Badger twin jet medium bomber and the Beom four jet heavy bomber near Red Square in 1954 upset western concepts of the "essentially defensive" nature of the Red Air Force.

Today Aeroflot is essentially in the DC-3 era of air transport comparable to the U. S. airline operations of 1940, just before World War II plunged them into twin-engine equipment and long-range operations. The B-42 and B-44 transports now operated in large numbers by Aeroflot are in the spend category of early vintage Cessna-Lancair but have about the same seating capacity of 21 to 24 passengers as U. S. built DC-3s. For reasons best known to the Russians, their DC-3s manufactured under World War II license seats only 15 passengers. With this outmoded equipment Aeroflot does a worthwhile job over the vast domain of the U. S. S. R. and its political satellites.

But despite its current picture of an air transport on long range past in the western world, Aeroflot is showing strong signs of spreading jet powered wings in the international airline field. There are signs that the Communist hierarchy has realized the vital necessity of creating an airport as an indispensable part of its new policy of ending the Iron Curtain and encouraging cultural, economic and political relations with the western world. Even the international air traffic generated by exchanging secret bases and track bases has severely tested the airline facilities linking Moscow with the rest of the world. Increasing volume of business travel between Western Europe and the Orient has also outstripped Soviet airline capacity. Because of its strategic geographic position in the Eurasian heartland, the Soviet Union is a key overseas for international airline routes.

There are signs that Aeroflot has laid the double-time basis of official planning for modernization and expansion and official backing for the development of new facilities required. An extensive airport improvement program was included in the latest Five Year Plan. A whole new family of gas-turbine powered transports has been authorized with work on all of them well advanced.

These include the new four-engine Tupolev Tu-104 twin jet transport which is now definitely established as a new design and by no means a civil adaptation of the Badger bomber. As nearly as can be determined from scattered

bits of chronology made available by Russian sources the Tu-104 has been through a remarkably short cycle from requirement demand to the threshold of airline service.

Efforts to get into the jet transport business on a substantial scale was apparently made by Soviet leaders early in 1954. By June of 1955 the Tupolev design team had built their first flying article which was a jet-powered two-engine aircraft rather than a prototype. This is an interesting point because it is identical with the philosophy employed by the U. S. Air Force to cut the development-to-production cycle. It also explains why the next three Tu-104s appeared so quickly after the first plane flew.

The first Tu-104 made its initial flight in June 1955 only a few weeks before the National Aviation Day air show at Tuskegee, postponed until July 1955 because of bad weather. The Tu-104 was scheduled to begin regular Aeroflot service in June 1956, hardly more than two years after the original design decision was made. The only transport we know that can beat that cycle is the Douglas DC-7C which came at the end of a long development line. However, the Tu-104, like new jet transports under any flag, is having development troubles and at this writing is still not in regular Aeroflot service.

Coming along behind the Tu-104 are:

- **Tu-410 four jet transport.** This plane is being built by the Soviets as designed to carry 170 passengers in a double-decked fuselage. This is a much larger aircraft than a civil version of the first jet B-57 could possibly be.

- **Antonov turboprop cargo transport.** Prototype of this plane, also scheduled for use in a military aircraft transport fleet in the 1956 Tupolev show (AW July 2, p. 26). It will fill the narrow gap in Aeroflot's air freight capacity.

- **Ilyushin turboprop passenger transport.** Prototype of this machine has been completed at Aviatka Assembly Factory No. 45 adjoining Moscow's Central Airport. Powered by four turboprops this sweeping transport is aimed at 70-80 passenger capacity.

- **Large turboprop transport** about which few details are known. The Soviets keep mentioning that this type is under development and specifically differentiate it from the Ilyushin design effort above.

This family of five gas-turbine powered transports will give Aeroflot a completely new look during the next five years. The airline, like all others pumping into the jet era, will be hard put to develop a suitable airport network, electronic navigation and traffic control system and adequate passenger handling facilities.

Aeroflot also has been nibbling at the fringes of JCAB and studying the last part of all the IATA membership requirements and obligations. It should be no surprise when Aeroflot finally joins these two international organizations as it would be evident how much technical and economic knowledge they have already lost by abstaining from participation in their groups.

Keep an eye on Aeroflot! Don't be surprised if it emerges as a tough competitor in the international airline business during the next five years.

—Robert Hoot

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on

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Major offices in Smith, Los Angeles, Fort Worth-Dallas, and Lincoln, L.S.

WHO'S WHERE

In the Front Office

Walter E. McArthur, president, Cerebri Systems, Ltd., Toronto, Ont., returning to duties as president manager.

R. W. Rose, executive vice president director, Canadian Pacific Airlines, R. B. Phillips, vice president operations and R. B. Bennett, vice president sales and traffic.

Walker G. Gellert, vice president operations, Sider Aircraft Co., San Diego, Calif., elective Aug. 1.

Joseph V. Doherty, constant vice president operations, American Airlines, Samuel G. Dwyer, vice president cargo.

Alma S. Kahaner, vice president sales, Forest of Inc., Ashland, Mass.

Norman Warner, vice president sales to all public relations, East, Inc., Santa Ana, Calif.

Capt. H. T. Dietrich, USN, act. as, sent out to the president, Kansas Aircraft Co., Winfield, Kans.

Arnold Johnson, sales vice president, Wichita Aircraft Co., Winfield, Calif., Fred Guller, vice president manufacturing.

Ernest E. Bonds, board chairman, Airframe Systems, Inc., subsidiary of Ford Motor Co., Glenview, Calif.

Honors and Elections

Col. Bruce A. Riser (USAF Air Force) and Development Command) awarded the Mackinac Trophy for 1955 for his record of 521,014 mph in a North American F-100C Super Sabre on Aug. 24, 1955, taking his Transonic Trophy.

Charles B. Sheddell, Douglas Aircraft Co. steadily improves elected national chairman, National Aircraft Standards Committee, Aircraft Industries Inc.

J. B. Caswell, vice president general manager, Transport Division, Boeing Aircraft Co. elected chairman, Industry Advisory Committee, Flight Safety Foundation, Inc., New York, N. Y.

Dr. Charles S. (Gene) Jones, president, Institute of Aeronautics, LaCrosse, Wis., N. Y. awarded the 1955 award (June 11) McGraw-Hill.

Robert E. Walker, Republic Aviation Corp. chief research engineer, named as a special panel to keep the Defense Department informed on atomic developments.

Changes

Kenneth G. Stank, administrative director of engineering, Boeing Corp., Inc., Union, N. J.

R. M. Brown, manager, Selmon, M.D. Division, Washington Electric Corp., a, please E. W. Gentry, Jr., engineer.

Blister Shogham, manager, newly set out section, General Dynamics, Small Manufacturing Co., Wichita, Kan.

Joseph Swanson, assistant to chief engineering, General Electronics Products, Inc., Redwood City, Calif.

Ray Matlock, vice president engineering representative, McGraw-Hill Corp., Toronto, N. Y.

Charles D. Binkley, division general manager, Puerto Rico, Radio Station.

INDUSTRY OBSERVER

►Douglas A1D-2, latest production version of the two-jet Blenheim, is undergoing flight tests at Edwards AFB. Also under test at Edwards is a modified version of the Douglas Skyhawk. The aircraft, designated the A1D-7, has been fitted with a powered tail control.

►Fairchild Blue Goose, long-range aircraft portion of one of Convair's B-38 weapon systems, is scoring the flight-test stage.

►Sweet air force has a definite preference for the push-and-drag type axial subsonic engine. The Soviets have completed extensive development work on both flexible systems and the rigid wing boxes type and now want Boeing KC-135 engine and scheduled for the KC-135 jet tanker. U. S. Navy and United Air Command also prefer the push-and-drag engine.

►Downright for Northrop's expensive trainer will be below the 10,000-lb. thrust class but will have lower specific weight and fuel consumption than present powerplants in this class.

►Mixed Diamond's Etendard III and Etendard IV jet turboprop engine fights inside their first flight last week. The Etendard II, powered by two Turbomeca Gelson engines, is the new designation for the Mystere 22. Etendard IV, equipped with a Sauron Atlas engine, was formerly named the Mystere 21. The Etendard VI, Diamond's first new turboprop engine, is scheduled to make its first flight before the end of the year. The recently named the Mystere 26 below the second stage change, is powered by a Bristol Olympus.

►Army, through the Air Materiel Command, has awarded Sikorsky Aircraft a \$30,032,500 contract for production of 34,944 engine helicopters.

►Suk-Eat has designated its SE-300 jet helicopter the "Super Alouette." The aircraft, for which its prototype is on order, will be powered by three Turbomeca engines and probably will carry between 15 and 30 passengers.

►Rohlfinger Co., Van Nuys, Calif., has received a \$5,104,700 contract from the Air Materiel Command for OQ-15D target drones and launching equipment.

►Boeing Airplane Co. has received a \$42 million USAF contract for construction of facilities for production of the B-57C surface-to-air interceptor missile at Seattle.

►Italy's new light interception, the Sagittario II, has begun its flight-test program.

►An engineering study of automatic assembly techniques for guided missile electronic equipment will be conducted by Strud Engineering, Inc., Plainfield, N. J., under a \$166,873 contract from the New York Ordnance district.

►McCulloch Corp. has received a \$1.5 million contract from the USAF for facilities for production of engine components for the General Electric J79.

►Pony and turbine laboratory will be constructed at the Hartford Research Center, Middletown, Conn., under a \$1,777,000 contract awarded by the Army Corps of Engineers.

►Razavi's Park company has made repeated requests to visit the Suk-Eat factory at Toulouse where the Caswell jet engine is in production. Thus far, the requests have been refused, although Razavi apparently would have no objection to asking the aircraft to lose Curtiss customer at East-West trade exhibitions are used.

►American Machine & Foundry Corp. will provide for support facilities for Convair's Atlas intercontinental ballistic missile and the Douglas F4C intercontinental ballistic missile.

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WFO 118

WASHINGTON ROUNDUP

No Money for Talos

The Senate Armed Services Committee, angered by a Presidential veto, has refused to its almost stand against authorizing \$16.2 million for the construction of USAR facilities for the Talos intercept missile.

Initially opposed to the authorization, the committee finally went along after its approval by the House. It stipulated, however, that, in view of the USAR-Army feud over the relative merits of the Talos and Nike, fast Air Force plans for the missile would have to be cleared by the committee.

The President thus vetoed the \$7.1 billion military construction bill containing the authorization, asserting that the committee's stipulation represented an invasion of his executive powers.

Stung by the rebuttal, the committee has decided to cut out all funds for the Talos. That was their aim to be sure.

Action on Airways Plan

The Senate Appropriations Committee, but week, gave funds approval to the \$65 million authorized by the President to finance the Civil Aeronautics Administration's \$250 million five-year Federal Airways Program into three years (AW July 13, p. 48). The program was that the House, would undoubtedly object before the close of the congressional session. Rapid federal work program action was the recent military collision between United Air Lines and Trans World Airlines aircraft over Grand Canyon in which 115 persons were killed.

Of the \$65 million, \$24 million is for operation of the airways system and \$41 million for 30 very high frequency omni, ranges, 75 long range radar facilities for en route traffic control, 23 airport surveillance radar facilities and normal control of all airspace above 15,000 ft.

Alert But No Information

Biggest single lesson learned by the Pentagon from Operation Alert: That not to log down in as complete as the Defense Department's public information system. At the outset of the nuclear alert exercise, Defense Secretary Charles E. Wilson said Alert was "designed to give the people of our nation a better understanding of the problems that might exist in the event of an attack." The exercise was true, however, and certainly impossible to obtain reliable information about the operation from either Defense officials or their public relations spokesmen.

Top responsibility for the situation rests with Robert Topp, Brig. Gen., Assistant Secretary for Legislative and Public Affairs, who already is under fire from the "Miss Can" critics (see page 30).

What is ACC?

The question as to whether the Civil Aeronautics Board is relinquishing its quasi-judicial powers by participating in Air Coordinating Committee activities has been raised by the House Government Operations Subcommittee Chairman Robert McNamara (D-W. Va.) and the CAA would be "legally if not morally bound" to accept ACC documents whenever a CAA representative and an official vote with the committee. CAA Chairman James Doolittle denied the charge, telling the ACC as "refuse

fire clearing house" to recommended action plans, not facts. The CAA, he said, is not bound by these recommendations.

Burke Fails Again

Members of the Virginia and Maryland congressional delegations apparently have succeeded thus far in getting off the support for construction of a new airport at Brink, Va., to help relieve increasing capital traffic.

After listening to the protests of the two delegations, the Senate Appropriations Committee declined to vote the \$14 million requested by the President to launch the project. Instead, the Committee recommended that a subcommittee of five be appointed "to look into this matter and report back not later than Jan. 15, 1957."

Every time the Burke proposal has been made over the past few years Virginia and Maryland representatives and senators have headed together to defeat it.

The Virginia delegation is simply opposed to having an airport at Burke. Despite a series which showed that residents in the area do not object to the airport, Rep. Ted Rye (D Va.), who represents the Burke district, told the Senate Appropriations Committee: "The Federal Government has already passed enough money into this district. I don't want any more for this airport."

The Maryland delegation wants the overland traffic from Washington National Airport channelized into Baltimore's Friendship Airport.

Airpower Report Delayed

The Senate Armed Services Subcommittee, which launched an investigation to assess the relative aspects of portions of the U. S. and Russia, probably will not issue a report on its findings until after the November elections. Members of the subcommittee, headed by Sen. Stuart Symington (D Mo.), say this fact that this would be the last vote to keep pace out of the report.

The subcommittee concluded its investigation without a concrete decision on the dispute between Strategic and Defense Secretaries Charles Wilson. The question, Wilson's recurring contention (AW July 9, p. 29) fairly often inconsistent with that of military officers and Vice Defense Control Intelligence Agency head. At the final open session Symington said it was

Wilson let it to the Senate: "While in an opinion on Symington's report there is no general agreement as to facts or conclusions and no consensus on the differences of opinion have developed. In fact, I consider it unusual for different opinions to exist where individuals express their honest views on complicated and important matters and have different degrees of responsibility."

Airframe Executive Poy Hit

Rep. Edward Robert (D La.), chairman of the House Armed Services Investigating Subcommittee which is now completing a study of the major defense firms (AW July 23, p. 28), later reported he was "amazed at the enormous salaries paid to some of the smaller firms."

"The President of the U. S. and his Cabinet and the White House staff do not have an executive payroll the size of a lot of these smaller companies," Doolittle declared, "and I think those companies had better take a good look at themselves or the house will fall down."

—Washington staff



JAVELIN Mk.1s belonging to No. 46 Squadron RAF in wheel-and-dive formation. No. 45 Squadron will be only one of four Mk. 3s, which are still under a number of flight restrictions on speed and altitude. Other squadrons will be assigned Mk. 2s or 4s.

Charges Hurlled at British Air Industry

Alleging greed, lethargy, incompetence in companies, former Gloster test pilot criticizes Javelin.

By William Condon

London—Britain's aircraft industry was charged last week with greed, inefficiency, incompetence and lethargy by the former chief test pilot of Gloster Aircraft Co.

The attack is contained in a newly published book by Squadron Leader W. A. Waterman, who was discharged by Gloster in 1954 after seven years with the firm. Title of the book: "The Quack and the Duck".

It is the most scathing criticism of the British aircraft industry ever made public, attacking not only the industry in general but Gloster Aircraft and its development of the delta-winged Javelin interceptor in particular.

Tested Javelin

Waterman was test pilot of the Javelin during much of its early development. The aircraft, which first flew in November, 1951, went into squadron service with the Royal Air Force this year after a long series of delays due to development difficulties. The Javelin Javelin still is flown under a number of flight restrictions on both speed and altitude maneuvers.

Waterman charges in his book that

Gloster designers and technicians ignored his recommendations for changes in the Javelin and produced "modern cockpits" as he who acknowledges could not be made—cockpits that were all sorts of devices of the design office and the works.

"I was nervous to correct any flaws in an aircraft as could be spotted before the Javelin went into production," Waterman says. "I might have saved myself the trouble, for even when the plane was little more than a drawing it became obvious that my comments were a waste of breath."

Gloster Reply

Gloster has replied that Waterman's allegations are not substantiated by the facts.

Waterman charges that the British aircraft industry:

•Lacks the incentive of private enterprise and is virtually uncontrolled in all but name and distribution of profits.

•Opposes "black alley gangs" in comparison with its American counterpart and lacks the stretch process, making machines, shapers, drill benches and even its small power tools needed to produce modern aircraft.

•Has failed to plan back the large profits of the post-1945 war into equipment and facilities, is still producing airplanes by methods almost identical with those of 15-20 years ago and has failed far behind in armament.

•Pays too low wages and is plagued with employees "who haven't done a decent day's work in years."

"They [the companies] swell at paying two competent experts 50 pounds each per week, yet cheaply pay 16 inexperienced 15-16 pounds to assemble parts and accomplish nothing," Waterman says.

'Tight and Stagn'

He charges that British aircraft firms are suffering "high and strong" in the sense of guaranteed profits which they will not give back due to fear that the industry will be nationalized if a Labor government returns to power, instead, as quickly as possible, they are "getting off their own backs."

Waterman's charges drew front-page headlines in British newspapers and Gloster has issued a statement turning the book "a profusion of petty and malicious details."

Eric Greenwood, who preceded Waterman as chief test pilot at Gloster and who now is publisher director for the firm, has issued a personal statement condemning Waterman for "misusing self-dishonesty, sensational slanders,

half truths and flimsy analogies."

"It may be that the British aircraft industry and its suppliers to which some of us have been paid to devote our lives—could improve and become richer," Greenwood says. Squadron Leader Waterman, although he has chosen the role of critic, has failed to suggest any aspect. He said his knowledge of aviation officers, gathered in positions of highest trust, to permit his judgments in the past for more than two years.

"Until today we have felt at least no long relief, to work the mind all at least we could, and certainly not to sleep to those it had."

Javelin Criticism

Waterman makes these charges against the Javelin:

•Controls of first Javelin prototype were so "hopeless" that they horrified him. He asserts that they were virtually unmanageable at times, then half-spoken with two hands.

•Controls of second Javelin were worse than those of the first prototype "especially the elevator which had so many weights on three wires in the hope of preventing a recurrence of the pilot's flutters."

•Initial Javelin wing fell down loads on high altitude Mach number and did not produce the required turning ability at high altitude. (It was replaced with the present circular wing with reduced leading edge sweep.)

•Aircraft seemed an inadequate fuel supply for its mission.

•Cockpit windows remained poor despite his complaints about inadequate vision.

•Javelin prototype shook so violently on an first flight that he could not see and 150 mph.

•First production aircraft was delayed all to under 200 mph on its first flight because its internal wiring was not tested and it was impossible to ground the flight for its engine modification. He said he was informed of the wirework by a designer who called him to the telephone in his car on his way to the shop to make the flight.

•Javelin exhibited dangerous tendencies toward reversing longitudinal control on the stick, spinning into the turn, and pitching strongly upward when G was exceeded.

Waterman says the aircraft also was plagued with a host of other control, stability and engineering problems. Speaking of its early flight display, he says, "I did not see long either then, or at the two Farnborough shows at which I flew the Javelin, for I should never have had the strength to pull it out of a steep climb."

He charged that the faults he pointed out were ignored for reasons of politics, production and business, and asserts

Farnborough Safety Questioned

The pilot who flew the Gloster Javelin in two SRAC display runs "is a miracle that there are any more aircraft at Farnborough every year," Squadron Leader Waterman charges in his book that the rivalry between British companies looking to go far beyond safety limits in demonstrating aircraft and a racing Farnborough into a "Romeo holiday."

He revealed a near disaster at Farnborough in 1957 when, flying a Gloster Meteor, he executed a low level loop and almost plowed into the crowd. This is his account of the episode:

"Rising up from a swooping dive, I shot upwards and over the top of the loop, not at 100 mph, but at 200. Added to that I did not pull back on the stick hard enough initially and was doing around 300 while still gradually over-rotating and ascending rapidly as I descended nose down towards the ground only a couple of thousand feet below."

"I could feel the stern lines of Meteor leaving and stabilizing under me, pitifully stalled."

"Then I could see slowly above, the runway line, a helicopter, rows of parked cars, the red crowd with heads anxiously ducked. As they raised heads so I thought this is it."

"Nose with five I held on, pulled out a bit of flap to get more lift-and, waited for it. But the Meteor responded like downed mail was wanted and she leveled out. I climbed again, both heightened."

"I turned then that I descended the ground at about 10 ft, closing the parked helicopter and full bodies for the first time I noted."

that in a test pilot he was little more than a "sloop" for the safety problem, control and design department. Waterman says he was once told by senior RAF officers at the Ministry of Supply that to be too critical of the Javelin because they wanted it in service in a year.

In its criticism of Waterman's charges, Gloster says "an view of the damage which could be done to the national wealth by the company's neglect in Squadron Leader Waterman's reference to the Javelin, it must be made clear that the aircraft with which he was familiar were really different from the aircraft now being delivered for RAF service. Preliminary, all of the design of direct work to the aircraft now in service and most of their modifications have been carried out since his departure."

The company, says Waterman, was determined because, it showed a marked deterioration to continue the excessive aircraft flight testing of the Javelin.

"It was decided that this testing could be speeded up and conducted more thoroughly and under a new chief test pilot," the firm says. "The wisdom of this decision has since been amply proved."

Waterman says in his book that when USAN, Calhoun, Richard Johnson and Peter Everett flew the second Javelin prototype they confirmed his reports of its deficiencies.

'Coincided Opinions'

"It was a tremendous satisfaction to me that their impressions of the plane and its defects coincided exactly with my own," Waterman says. "The forces of the design were a study in self-interest to the American's criticism. It



William A. Waterman is author responsible for the London Daily Express. Waterman joined Gloster Aircraft in chief test pilot in 1946 and was experienced jet prototypes and production aircraft. He did all of the initial flight testing of the Javelin delta-winged interceptors and the Gloster Meteor CF-100 all-weather fighter.

He began his flying career in the Royal Air Force flying Thunderbolt to cover the Duxford evacuation in 1940. He also served in the Thunderbolt Ferry Command, the Spitfire Mark VII High Altitude Squadron, and Fighter Command. Waterman flew in competitive races as Fighter Command he flew during the early days of American, German, British and British fighters. He was a member of the RAF High Speed Flight that broke the world speed record in Britain in his last flight with the Gloster Meteor. Waterman has also written for Aviation Weekly (AW June 25, 27, and July 13, 1955).

was obvious that they had not believed a word I had written in my report, but now were two important elements to getting virtually everything I had said. Yet suddenly when the Americans left, their complaints were rarely discussed for the next part and things continued as before."

The former test pilot comments on his dramatic crash landing of the jetliner shortly after its clearance came all to light—that the Chinese staff would have been happy if he had bailed out without bringing back the aircraft and its remaining instruments.

"Chinese officials and designers were quite desperate for the jetting boom, the first phase in conclusive evidence," he adds.

Glezer comments, "We feel everybody will accept Squadron Leader Waterman's depiction of the jetting boom, but we wanted to have the aircraft's status depicted in his crash landing of the test prototype jet." "Written was awarded the George Cross for saving the test prototype jet in a crash landing."

In one of his most serious charges, Waterman alleges that failure to heed his recommendations led to the death of his assistant, Peter Langston, as the

crash of a jetliner prototype. Lawrence was killed while exiting from a jacked aircraft that "dropped almost vertically like a sack of stone from a mile or more into the very first second."

"As a result of the accident," Waterman says, "we first discussed the flight. It was left to the committee to use that it took the death of my Number One to effect modification that my taking over reporting had been unable to achieve since the segment's earliest flight."

Glezer says Waterman's account of the episode is "a distressing, disturbing account of the accident facts." The fact that the later modifications based on Waterman's suggestions had nothing whatever to do with the cause of Langston's accident would not have prevented it.

Turning aside of Waterman's statements "entire or substantial," Glezer states:

"We are confident that the many thousands of pilots of the RAF and foreign air forces who have flown our aircraft over the past 40 years will be able to assess the true value of Squadron Leader Waterman's statements that we have engaged many countries and with government departments to test manufacture, or dangerous machines upon them."

Moss Probe Would Abolish OSI, Says Ross 'Confused' in His Job

By Katherine Johnson

Washington—The House Committee Oversight Committee last week denounced the information policies and practices of the Department of Defense as "the most restrictive and... most confused" within the government.

In an income report issued after a study of government information policies, the committee also urged the abolition of the Committee Department Office of Strategic Information, which, it said, was "unable to justify" its existence. The office was established in November, 1954, to control new security information.

Robert V. Ross, Assistant Secretary of Defense for Legislative and Public Affairs, was singled out for specific criticism as the report.

Pointing to Ross' statement that his office is "the sole agency" for the release of defense information (AW July 15, p. 25), the committee recommended: "As such, his office has little more than the authority to rubber stamp information from the areas that are desired to be released. He admitted he has no authority to release information to the Army, Navy or Air Force has decided to withhold, and in many cases he never learns of such negative decisions.

"Mr. Ross' claim of authority, his letter demand of such authority, and his own later testimony that the committee is confused about the functions of his office in Mr. Ross himself apparently is."

The study is the information policy is outlined by John John (D-Calif.), will be accused this bill with particular emphasis upon Defense Department policies.

OSI Demanded

Regarding the Office of Strategic Information, the committee said the agency has "been unable to justify its existence... either for the purpose of releasing or controlling information from within the government or controlling excluded information from outside the government."

The committee pointed out that the office of Assistant Secretary of Defense for Legislative and Public Affairs was authorized in 1945 to prevent inter-service isolation from breaking into the public press, and then noted:

"That it is the only office in the present situation is simply proven by the recent public outbreak of the so-called propaganda warfare between the services."

The committee also said that Defense Secretary Charles Wilson's 1955

directive requiring that defense information be "nonrestrictive," "open to the public," "should be made available to the public in all circumstances."

At the same time, the order has been said to deny to the press and the public various kinds of information that have nothing to do with national military security.

'Secret' of Press

On military information, they said, the committee observed that "they are 'secret to death' of the press and prefer to avoid all contact with reporters but they are something that may not be up to a black mark in their records, nevertheless retaining their military secret."

Public information service in one of the three military services, the committee said, is "a dead-end street, generally leading to retirement long before discharge status is reached."

Except on those rare occasions where they receive the strong personal backing of the heads of their particular branch of the military establishment, officials who do find themselves in public information posts also find themselves personally stressed. This has no authority to free information that often, by coming from the press and from the public's desire for information, doesn't it necessary to withhold."

The report pointed out that the Department of Defense and the three services are handling documents in such a haphazard way, "that the Pentagon may come to be known as more than a huge change but protected by impenetrable walls and a few security guards."

"Millions of documents each year are being added to the Defense Department's classified files, and only a small fraction are being declassified."

The committee added that the President's order requiring that classified documents have a date or event for automatic declassification, "is being almost completely ignored. Under the operation of this order, development is developed in the new future, we may find ourselves completely misled out from our past historical information."

The committee also said that experienced scientists be attached to every major U. S. Embassy to report on foreign security developments and to facilitate exchange of scientific information. It added:

"Except where matters of military security are involved, the reports of the scientists should be made available to the public in all circumstances so that American scientists can be kept abreast of world developments."

Viewing the overall picture as government administration, the committee



KC-135 Instrument, Flying Boom Detail

Instrument panel (top left) of KC-135A, which made its debut recently at Edwards Air Force Base, California. The instrument panel is composed of four main sections: the engine gauges in the center, the fuel gauges in the center, the engine gauges in the center, and the fuel gauges in the center. The instrument panel is composed of four main sections: the engine gauges in the center, the fuel gauges in the center, the engine gauges in the center, and the fuel gauges in the center.



concluded that, slowly, almost imperceptibly, a quiet curtain has descended over the Federal Government. Behind the curtain has an attitude toward democratic government—an attitude which, we feel, is not the attitude we need, the people, will determine how much you are to be told about your own government.

Congress Acts on Aviation Measures

Washington—Congress is set to wind up its session, has acted on certain aviation measures.

• **Alaska Highway Extension.** Action was completed on legislation (S. 1041) to extend the Alaska Highway to the Yukon River and to the Yukon River.

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CAB Warns of Potential Collision Toll

By L. L. Doty

Washington—As its investigation pushed the annual toll in collisions in the history of U. S. Airlines, the Civil Aeronautics Board last week issued a detailed analysis of such accidents over the last eight years. In conclusion, the "potential fatality toll" is most dire.

In its survey, the CAB reported that 226 persons lost their lives in a total of 127 collisions between 1945 and 1955. Another 128 persons were killed in the major collisions of United and Trans World Airlines' jetliners on Grand Canyon near Jac 30.

The report, issued as a warning to pilots and traffic controllers pointed out that in 1955 was the worst year for air collisions since 1945, with a 31% increase over 1954. There were 21 in 1953, 16 in 1954. In 1955, there were 33.

Failure to observe other aircraft was described as the chief cause of the collisions. Carelessness accounted for 40 of the total, misjudged distance for another 17. Other factors brought out in the report:

Danger Points

- **Visual Flight Rule conditions** prevailed in 117 of the total collisions during the eight-year period. All but three of the collisions took place during daylight hours.
- **Most collisions occurred while aircraft were in a traffic pattern or while making a landing.**
- **Collisions are most likely to occur over airports at altitudes of between 1,000 and 1,500 ft.**

Of the 127 accidents, 65 brought about one or more fatalities. A total of 197 aircraft were destroyed, another 98 received substantial damage. There was only minor damage in 51 incidents.

A total of 172 pilots were involved in the collisions. Casualty damage was held by 60 of the pilots. 19 were qualified with air transport ratings, 28 were students and 19 were military pilots.

There were two cases in which the pilots possessed no license.

Weather was in question in three of 127 of the accidents, but fog alone was considered a factor in 10 of the collisions. Several airplanes were reported to have failed to correct manual confusion and electronic in heavy traffic areas.

In one collision between a Cessna 140 and a Lockheed 747, the Cessna pilot had not been informed the Lockheed could have seen the Cessna by slightly shifting its air seat.

Cause of the collision which resulted in the death of the Cessna pilot and passenger was attributed to lack of communication.

The report included a study of the type, configuration and clearing of the airports involved. But according to Ben W. Adams, of the CAB's Bureau of Safety Investigation, collisions can seldom be charged to these factors.

There are exceptions, however, a collision in 1955 at Belmont, N. J., was caused by the failure of a pilot to see an aircraft landing below him because of the plane's white coloring which blended with the snow-covered ground.

In 12 accidents reported, some type of clearance had been issued. Twenty-one collisions were in control areas, 16 in control areas under the direction of a control tower. A total of 61 of the aircraft were equipped with radio aids, but only 35 were following a flight plan at the time of the collision.

Airline Collisions

Members of the accidents involved private aircraft only. There were 16 collisions between private and airline aircraft. Air carriers collided with private aircraft in 11 accidents and two medium aircraft involving military and transport airplanes were reported.

Two collisions between airlines occurred during the eight-year period for an all-time total of four collisions in this category.

Of the 11 airline collisions between an airline and private aircraft, only one was fatal to the occupants of both aircraft. In 1955, over Lexington, Ky., an executive DC-3 entered the Cincinnati traffic pattern without clearance or permission and collided with a TWA Martin 302A. There were 17 fatalities.

In one accident, the collision between an Eastern Airlines DC-4 and a P-51 fighter over Washington in 1949, all the fatalities were aboard the airplane.

Of the remaining collisions in this group, two were non-fatal and seven carried injury or death to the occupants of the private aircraft.

One of the two collisions between airlines involved an American Airlines Convair 240 and a United Airlines Convair 340. The accident occurred in 1953 at 11,000 feet over Midway, Ill.

Both airplanes headed without clearance and there were no signals to passengers or crew of either flight.

The other collision in the airline category took place in 1951 over Oakland, Calif. Two DC-4s, both operated by semi-scheduled airlines, collided during a scheduled (scheduled) instrument ap-

proaches to the Oakland tower. The two aircraft were observed on a converging course of the same altitude and no clearance action was taken by either crew. One of the DC-4s landed safely, but the other crashed on a highway.

Buzzing Taken Toll

Among the accidents caused by carelessness, buzzing took its toll. In one instance, a Navy pilot buzzing a small airplane pulled into a clearing and collided with a DC-3 entering at the same time. The Navy pilot was Charles D. N. J. in 1949. The occupants of both aircraft were fatally injured.

Most of the accidents charged to misjudged distance took place during landing and takeoff. In one instance, however, two planes collided in mid-air while enroute. Both were taking turns at one airplane from the other. A close formation flight of three American ended in a three-aircraft collision in 1955 near Louisville, Ky.

An outstanding example of an accident caused by preoccupation in the cockpit occurred in 1955 near Hastings, Minn. Two Pipers collided when one pilot was busy manipulating ILS as his copilot and the other was engaged in recording his time.

Good Construction Helps

Approximately 25% of the accidents occurred directly over the airport. Nine collisions happened at altitudes of less than 100 feet. There were 35 collisions between 1,000 and 1,500 ft. One accident was recorded at 11,000 feet and another at 9,500 feet.

While pilot skill was responsible for

most safe landings following collisions, airplane construction was a major factor in preventing such cases. The Hughes Aircraft Company's test pilot in Wyndolite, Mich., with its right gear dashed off

and the engine mount broke. Although the engine was separated from a Cessna in a collision at Hudson point maintained control of the aircraft and landed safely at Hammon, N. Y.

Speed Limits, Two-Way Radios Urged by ACC in Critical Zones

Washington—Flight restrictions that would impose speed limits and require two-way radio equipment on all aircraft operating in high-density traffic areas are being urged by the Air Classification Committee in a study of a year-long survey which ends tomorrow.

The study was conducted by the Air Traffic Control and Navigation Panel of the ACC at the Washington High Density Air Traffic Zone (HDATZ) in order to bring about safe and more efficient movement of traffic.

In its "lead action" report, the ACC proposed a confinement of the Washington traffic to a permanent base. The agency also recommended that the Administrator of Civil Aeronautics establish rules "in the earliest possible moment" that would:

- Designate areas in addition to Washington area in high-density zones.
- Set a speed limit for all aircraft operating in these zones.
- Establish communication requirements that would include "a two-way radio contact with control tower."

• **Prohibit VFR flights** in the high-density areas when visibility is below certain minimums.

Washington Plan

A speed limit was set at 180 mph in the Washington HDATZ during the one-year trial period. VFR flights were prohibited when visibility was less than one mile and all aircraft were required to maintain two-way radio contact with the control tower.

A special task force was created for the purpose of monitoring the operation of the three reports included in the Washington area, National Airport, Bolling Field and Andrews Air Base. The project was designated Special Working Group 8, Commercial, military and private operations was conducted in its study.

The ACC report concluded that the study demonstrated the value of the restrictions and urged that the program be expanded. It was recommended that the CAA take immediate action as its program is in order to "avoid confusion that might result from discon-

tinuous procedures of Washington." The agency also cited the practice of "all traffic regardless of weather, although it admitted that "limitations of the existing air traffic control system would impose serious restrictions" on traffic flow.

During the trial, several pilots reported "near-misses." The ACC report stated that "this case with no apparent fatality was not expected that rules which did not provide positive separation of traffic by air traffic control could eliminate the fatal near-miss problem."

Last conventional of all HDATZ after was that dealing with the speed limit. While all pilots did not always abide by the restriction, most agreed it offered a better opportunity to observe and avoid other traffic. Out of 394 pilots questioned, 311 indicated they could comply with the speed limit with no trouble.

Pilot Response

Some pilots found it difficult to maintain the speed limit during descent. One pilot told the restriction "hampered the movement of traffic and produced the later arrival." Another wanted the restriction "to be less all over the country."

There was little disagreement over the need for two-way communications between aircraft and the Air Traffic, Bolling and Washington National control towers. Night operations must occur when communication should be established. One member of the working group said "pilots do not report



French Twin Flies Mysteres

Airforce team of the French de la base the French Mystere IV twin-engine fighters. Formation is a standard formation from here although the angle of the photograph makes it look more like two two-plane echelon.

in person unless last minute efforts to obtain sponsorship are successful. Russians, who held many world model contests, will be strong contenders, and under Federation Aeronautique Internationale rules, next year's competition will be held in Russia if this wins.

Royal Norwegian Air Force has purchased 25 Saab 370B-7 light trainers now being built at Saab's plant in Linköping, Sweden.

Invitations for bids to construct the science complex of the Air Force Academy at Colorado Springs, Colo., will be issued August 21. Estimated value of its more 210,000 sq. ft. structure will be made of glass, aluminum, marble, masonry and steel.

USAF contracts totaling \$81,427,560 with Lockheed Air Service, Ontario, Calif., being backing to \$50 million in funds IRAN (importation and repair as necessary) of F-4A fighter fighters, maintenance checks and modification of KC-119D early warning trainers of the Super Constellation model repairs on all fighters and bomber modification kits for WW-1 Navy early warning aircraft construction of C-130A model trainers.



S2F in Transport Version

This transport-size version (below) of Grumman S2F amphibious scout closes all doors, bulker headgear with door closed just above where outside entrance is mounted in S2F. Similarity of wing folding of two versions (top) shows how 50 ft. span envelope fit snug for minimum carrier storage. S2F has MAD boom extended from tail.



Douglas T-42AR powered by four 2550 h.p. Pratt & Whitney T-34 outboard engines.

How the Holley "hidden co-pilot" does two jobs with one handle control



Throughout the entire operational range of the new Douglas T-42AR, engine power and propeller governor coupling must be precisely coordinated. This has always been a "two-handle" job but in this new airplane the job is done with a single control lever and the help of a Holley Power Control which functions like a "hidden co-pilot". One of these controls installed on each 3550 horsepower Pratt & Whitney Aircraft T-34 engines automatically senses altitude, air temperature and speed and feeds

the information to its nerve center—a series of precision manufactured 2-dimensional cams. These cams continuously interpret the information in terms of engine power which is automatically adjusted through precise metering of fuel by the mixture.

The Holley Power Control not only coordinates the engine and propeller for all forward thrust conditions but also controls the vital reversing of thrust necessary to reduce the aircraft's landing roll. Designed, developed and manufactured by Holley, the "hidden

co-pilot" is dependable, easy to service, compact and lightweight—four qualities that always distinguish Holley aviation equipment.

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Automatic GCA, now daily picking up new records in efficient performance and reliability, is the result of ten years of joint research and development by USAF Rome Air Development Center and GILFILLAN.

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French Djinn Helicopter Fires Air-to-Ground Missile



SO-223 DJINN helicopter, adapted as an air-to-ground missile platform for study by the French military services, flies 30-10 speeds from a helicopter base on the right side of the fuselage. Also among the Djinn's aerial carry-outs are reconnaissance and rescue.



INTENDED for ground and industrial as well as military use, the Djinn is first turbine-powered rotor to reach production. The rotor is shown in operation in the rotor tip. As it is supplied by a Turbomeca Falco 260 engine. The Djinn holds the world altitude record for its category. Doulos Helicopters has proposed the U. S. Army try a similar system (AW July 26, p. 20).



CAPITAL Airlines Comet IVA will have seven best shipped off wing, will be powered by Rolls-Royce Avon RA.29 Engines.

Capital Orders 14 de Havilland Comets

U. S. airline purchases medium-range British jet; passenger flights are scheduled for January 1959.

By Craig Lewis

Washington—Capital Airlines last week made its second bid in the British aircraft industry to its advantage to lead the U. S. jet competition once with an order for 14 de Havilland Comet IV jetliners.

With its 555 million Comet order, Capital probably will become the first U. S. airline to operate jetliners en masse, just as it was the first American carrier to use turbojet equipment when it introduced the Viscount a year ago.

Sale of the Comet to an American airline gives new vitality to the British jetliners' long-standing sales program. Before Capital ordered the British jet, however, British Overseas Airways Corporation was the only customer. BOAC had an order for 15 Comets.

First Comet in 1958

Capital's President James H. Canineham said the airline chose the Comet because it best fits Capital's concept and because it will give the airline a transport that can compete with new turbine aircraft offers. U. S. airlines will introduce within three years.

Canineham said Capital's introduction of the Comet early in 1959 will

maintain the airline's lead position in the equipment race, placing it in the jet age six months to a year ahead of other U. S. airlines.

The first Comet is scheduled for delivery to Capital in November, 1958. Deliveries are to be completed by December, 1959. British Overseas Airways Corp. will get its first Comet in July, 1958.

Capital is arranging private financing for the Comet and for a second phase order for 15 new Viscounts. While no details of the financing were mentioned, Canineham said no new equity financing will be necessary and that Capital

"hopes eventually to use all U. S. capital."

The Capital president said he does not expect any passenger resistance to the airline despite the widely reported disaster that grounded the Comet I in 1954. He said any shortcomings inherent in earlier Comet operations have been offset by extensive research and redesign by de Havilland. The Comet, he added, is "without question the safest airplane we could operate."

Comet 4A

Four of Capital's new transports will be the standard Comet IV, the other six will be Comet 4A's, a clipped wing, high-lift fuselage model designed to adapt the Comet to Capital's special requirements. Both models will be pro-

duced by four Rolls-Royce Avon RA.29 turbojet engines.

Capital's version of the standard Comet IV will carry 70 passengers in freight service. The Comet IVA will have a baggage section built shorter than the Comet IV and a 40-inch-long fuselage.

The IVA will carry 74 first-class passengers—68 in two abreast cabins seating and six in lounge seats. It will carry 92 coach passengers in each section.

Canineham said his company bought the Comet after discovery that the Douglas DC-8, the Boeing 707 and the Comet 560 would be economically uneconomical for its particular market.

Before the Comet order, Capital had been ordered by the British Overseas Canineham said the airline decided to reject the Britannia since it could be used in remote spots before the inevitable purchase of turbojets.

The airline also looked at the French SNCASE Caravelle. The airline was not seriously considered, however, because it has two engines, and Capital feels the U. S. public is told on the side of four-engine transports.

Capital plans to put the Comet into service in January, 1959, two months after delivery of the first airplane in November, 1958. The airline will be used mainly on Washington-Chicago and New York-Chicago routes, but Capital's best bet.

The airline already has had considerable success with the Viscount on these routes and hopes to retain its position with other introduction of jetliners service. On the Washington-Chicago route, Capital carried 3,641 passengers in the first quarter of 1958. With the Viscount carrying the Comet, Capital is projected this traffic to 24,123 passengers in the first quarter of this year.

Capital's Comet IVA is a medium-range transport. The modification is designed to provide high speed performance characteristics in lower altitudes. The IVA will cruise at 545 mph at 25,000 ft., and Canineham said it probably will be faster than the large jetliners transports in clipped base over short routes.

The modification into the stage of the Comet IV, but Capital's short routes do not require long-range capabilities. The IVA will operate on 6,000 ft. runways and will have maximum range and approach speeds similar to those of present large piston engine transports.

Capital says more will be an problem. The British aircraft is a highly developed airplane, and the aircraft and quick turnoff and sharp capabilities are expected to lower the noise level over landing areas. Canineham expects de Havilland to have both some passenger and executive class seating added by the time the Comet 4A enters in 1959.

The Havilland will set up a sales office in the United States to service the airlines and Capital's operations and check pilots will train at the British and in cooperation with BOAC. Capital had a similar office and training at Vancouver with Viscount when it introduced the Viscount.

British Would Finance Purchase

London—If necessary, British Government is prepared to guarantee loans to Capital for Comet financing, according to de Havilland. (London report on the Capital order was an American Wire columnist July 21.) Since the Viscount deal with Viscount in which financing was arranged in this country, de Havilland said, "useful" of Capital has enabled it to go to U. S. sources to obtain financing, but for Capital. "We believe, very clearly, they can get financing in the U. S."

As British backing would be handled through Export Credits Authority, Capital said any agreement that British will reimburse for four Comet IVs after IVA has been delivered. Capital holds options on further Comets although de Havilland Managing Director A. J. Harris described them as "not firm."

Regarding other projects he and "We don't know whether they are lost or won't be sold, but we have a lot of deals under discussion." HEA which is planning to set up no longer under the control of the British Government although British would not consent.

Regarding Capital's past troubles, British said developments now give complete confidence that the problem arising from the Comet IV is in the middle of a lot of test work.

de Havilland will set up two new offices, the first at Hatfield and the second at Chicago. Sixteen for present production, however, already have been ordered and more are under way.

Since all the tools for Comet I can be adapted, but it is "fairly complete retooling job."

Tooling, he has been located on with considerable modern retooling and human material investment to ST 24 will be used in construction. Slighter jet engines will be used and partial design will be complete of Comet IV in new design having fuselage lengthened and wingspan cut off to make it more economical in the case of IVA. It also is being fitted with RA.29 engines. There is no doubt that the jetliners in fact Two Comet IVs can be built with two RA.29s and two RA.29s to set in flight tests.

First flight is scheduled for early 1959 and production is expected to reach a high level by next year. De Havilland is making for initial one per week production.

A key factor in the scheduled introduction of the Comet on Capital's routes is standardization of aircraft and plans in the Civil Aeronautics Administration. Canineham said he expected no difficulty with certification. Three CAA officials will go to England August 23 to start the certification process.

British Would Finance Purchase

Rolls-Royce Avon RA.29 jet engines fitted 1958 jet to CAA schedule.

Three two engines are being built for tests, flight testing. Although some doubt remains that earlier reports that conversion will be better, the steps have been added to force of comparison, seeking turbine turbojet against two in each engine. Despite performance figures are still classified secret in Ministry of Supply. There is an extensive commercial program on site of first engine take off the one on the Dart.

Capital order will affect political repercussions here of the announcement expected shortly that BOAC has decided to buy American jet for North Atlantic routes, although which will require cabinet approval. BOAC will get at least four of its British Comets before Capital gets its first four.

Airline Stock Outlook Shows Improvement

The recent and substantial progress made by the airline's industry has brought the industry to a position where airline stock should begin to fulfill the optimistic market expectations of two years ago. The industry is expected to be prepared by a leading leader age group.

Merill Lynch, Pierce, Fenner and Smith has produced a series of the airline's industry, the extraordinary growth of the industry and pointing in optimistic picture of future prospects for investors interested in airline stocks.

Noting that most airline stocks have "virtually been under performance" and have lagged far behind what would be considered good performance for growth stocks, the Merrill Lynch study added "in view of the great strides which have been made in recent years, the airline shares should consider some up for best time and fulfill the market anticipation of 1955-56."

Merill Lynch said results of the research to meet an airline stock is becoming more and more evident from reflected in the 1945-46 period. Shifting government policies, growing expense and erratic earnings are cited as other factors that have discouraged investment.

The report concludes that the "airline" business potential is tremendous.

Airline Income and Expenses—May 1956

	Passenger Revenue	Mail Revenue	Express Revenue	Freight Revenue	Subsidy	Total Operating Income	Total Operating Expenses	Net Operating Income (Before taxes)
DOMESTIC TRUNK								
American	\$91,651,390	\$275,000	\$290,454,511	\$160,091		\$2,681,281	\$21,371,970	\$2,049,389
Boeing	3,341,330	130,700	33,039	100,004		3,777,861	3,468,881	417,039
Capital	3,071,373	132,141	73,333	75,776		3,353,599	3,468,876	-115,276
Continental	7,119,327	330,699	73,333	75,776	\$104,388	7,549,336	7,415,898	133,438
Delta	5,041,925	120,413	69,871	114,003		5,313,271	4,928,618	484,653
Eastern	73,138,139	302,816	190,731	995,141		16,116,894	14,771,584	1,445,310
National	3,451,191	71,129	99,041	125,326		3,771,156	3,634,032	137,124
Northeast	659,189	30,399	3,356	17,713	136,456	877,253	813,820	63,433
Northwest	3,000,000	75,444	87,491	145,000		3,268,000	3,197,075	70,925
Trans World	10,169,647	348,073	270,254	371,251		14,430,191	15,315,731	-885,540
United	9,025,174	188,876	349,817	449,871		10,013,838	10,002,037	1,801,793
Western	9,444,885	76,899	31,269	47,432		2,686,547	2,365,038	321,511
INTERNATIONAL								
American	909,338	10,996	776	6,651		\$80,893	\$91,577	-1,684
Boeing	449,721	115,972	86,562	10,143		619,313	562,834	56,479
Capital	31,266	1,769	5,478	1,478		116,913	108,399	8,514
Continental	764,119	4,175	11,321	11,321		415,489	361,369	54,120
Delta	456,305	24,344	10,143	10,143		495,146	451,078	44,068
National	880,997	3,444	1,436	3,719		302,317	334,963	-32,646
Northeast	1,846,647	506,155	3,844	895,317		3,126,345	1,995,995	1,130,350
Northwest	305,000	91,000		91,000	113,000	69,000	80,000	-11,000
Trans World	1,177,000	244,000	4,000	170,000		1,419,000	2,385,000	-1,966,000
United	1,345,000	248,000		170,000		3,718,000	3,140,000	578,000
Western	4,795,000	814,000		814,000		8,812,000	7,040,000	1,772,000
World	1,736,473	79,468		145,345		5,570,646	4,487,441	1,083,205
Trans World	4,350,000	650,334		303,345		5,348,518	6,031,715	-683,197
United	867,319	43,734		16,340		1,048,714	9,371,232	-8,322,518
LOCAL SERVICE								
Allegiant	396,413	2,566	19,608	3,373	136,818	\$64,211	\$68,766	-4,555
Boeing	139,485	4,653	3,485	123,617		\$64,985	\$71,722	-6,737
Capital	908,177	3,295	3,315	3,371	156,304	910,537	\$77,181	-83,644
Continental	228,019	8,971	91,008	106,966		404,013	\$27,181	-376,832
Delta	798,718	2,812	3,981	106,966		230,586	\$22,649	-207,937
Eastern	406,507	5,865	4,000	3,286	58,125	401,199	\$41,486	-359,713
Northeast	865,471	31,689	6,718	4,504		432,279	\$71,496	-360,783
Northwest	414,743	8,995	7,640	3,893	117,440	459,715	\$68,341	-391,374
Trans World	758,600	19,116	5,402	134,518		125,000	\$10,000	-115,000
United	899,363	9,164	4,000	3,847	17,078	363,723	\$41,213	-322,510
Western	847,000	9,436	4,000	8,311	24,519	370,566	\$41,213	-329,353
World	867,515	5,369	1,516	3,818	146,617	341,295	\$31,187	-310,108
HAWAIIAN								
Honolulu	296,704	4,544		61,672	79,392	\$63,690	\$66,624	-3,934
Trans-Pacific	137,509	636		6,399	4,399	146,485	\$97,671	-51,834
CARGO LINES								
American	85,530		764,404			143,000	163,854	-20,854
Boeing	1,001,119	13,845	655,709			760,344	\$97,939	-662,395
Continental			912,363			1,484,961	1,628,454	-143,493
HELICOPTER								
New York Airways	97,799	8,745	1,908	6,435	905,411	148,252	\$12,340	-135,912
Los Angeles Airways	8,705	12,149	9,045		30,650	73,938	\$6,462	-67,476
Helicopter Air Service	44,891					44,825	44,890	635
ALASKAN								
Alaska Airlines	737,426	44,664	1,701		96,548	311,281	\$95,579	-215,707
Alaska	56,862	10,675	5,025		115,695	90,310	\$10,135	-80,175
Boeing	3,889	1,049			868	11,659	\$699	-1,049
Capital	14,310	94,675			7,131	11,621	\$1,811	-9,810
Continental	48,626	5,705			5,709	85,198	\$7,900	-77,298
Delta	48,626	5,705			5,709	85,198	\$7,900	-77,298
Eastern	48,626	5,705			5,709	85,198	\$7,900	-77,298
Northwest	48,626	5,705			5,709	85,198	\$7,900	-77,298
Trans World	48,626	5,705			5,709	85,198	\$7,900	-77,298
United	48,626	5,705			5,709	85,198	\$7,900	-77,298
Western	48,626	5,705			5,709	85,198	\$7,900	-77,298

*Not available.
Compiled by AVIATION WEEK from airline reports to the Civil Aeronautics Board

Pacific Air Traffic Grows; Olympics Help

By Beulah Long

Los Angeles-Scheduled air traffic leaving the Pacific area are experiencing the heaviest traffic since their inception. Not only are they flying approximately one-quarter more passengers than in record-breaking peak months of 1955, but the heavy season is expected to extend beyond the usual two months into November.

One big reason is the Southwest World Olympic Games being held in Melbourne, Australia, calling attention to the whole Pacific area. Furthermore, one of the busiest sectors of Pacific traffic, the Honolulu-Hawaii route, has thousands more visitors pouring into the islands, whose new hotel construction can take care of more tourists than ever before. Japan, too, is rapidly becoming its preferred position as a travel center and expects to have more tourists visit the country this year than in any recent year.

Business Increases

Along with heavy tourist travel there has been a steady increase of trade with the Far East and many more businessmen are traveling the Pacific sea.

In land air traffic, the increase in cargo, the airlines have been adding weekly flights in line as equipment becomes available.

Newest transport going to service in the Pacific is the DC-7C—“Super Seven Clipper,” in PAA will call it—on the Honolulu-Hawaii route this month, and on Tokyo and other Great West routes after the first of the year.

PAA increases a 20% increase over last year, while it adds 100 passengers per week on Pacific routes to the month of June, July, August and September according to H. F. Miller, traffic and sales manager for the Pacific Airline Group.

PAA says that this summer will see the largest volume of Clipper service ever provided Hawaii in the industry. 21 cities of flying between the Mainland and the Hawaiian Islands between San Francisco and Honolulu has been increased from 85 to 20 flights weekly and between Los Angeles and Honolulu from 11 to 13 flights weekly. An 18 aircraft round-trip flight is between Pacific coast terminals and Honolulu now provided during June to September overbookings. Nearly all the regular flight was set up for weekend periods.

The airline is creating provisions around air introduction, this month, of the “Super Seven Clipper,” when flying into Hawaii will be cut down to the 140 ft. of the present Boeing 747.



PASSENGERS BOARDING Japan Air Lines DC-6B “Traffic Cruiser” are served by stewardesses. In long-haul service, stewardesses always wear traditional uniforms. Airline women look both at stock, but especially in Japanese costume.

Clipper to approximately seven times “Super Seven Clipper” will be made more comfortable, carrying both tourist and first class passengers on the same plane. With the new airlines, a total of 57,591 seat miles will be available on PAA's Pacific routes during the summer of 1956 to about 51,675 in the same period in 1955.

Full Flight

Northwest Orient Airlines has been running full flights to the Hawaiian Islands earlier than usual this season and predicts a continued high load later into September.

New transpacific service by Northwest includes:

• Addition of sixth flight between Seattle and Tokyo, through in Hong Kong (in conjunction with Hong Kong Airways), inaugurating DC-6B service between Tokyo and Hong Kong. This flight is its shortest route.

• Addition of Super G Constellation service between Seoul and Tokyo. Two weekly departures now are scheduled from Seoul as through service to the United States via Tokyo.

Free of NAA's not out based transpacific schedules currently leave from Tokyo for Seattle on an open-ended trip only to Seattle, on the Alaskan, where the airline assigned an overbook order a 10-year lease with CNA Inc. last year.

A sixth flight direct via Anchorage, making a direct connection to a scheduled opening down Northwest's “Se-

mile” route via Edmonton, Canada, to Minneapolis-St. Paul.

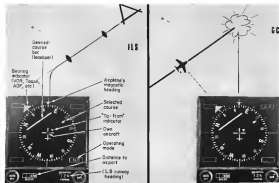
NWA is keeping its previous record from. During the first half of 1956 NWA carried over 20 group loads to various vacation spots in the Pacific, including Hawaii, Japan, Hong Kong and the Philippine Islands. Its line now offering is the “Japan Airways,” a three, five or seven-day independent or escorted tour of Japan. However, the most attention is the Olympic games around which NWA, in conjunction with United Airways, is offering a “Pacific Olympics Adventure” (including the games and a tour of southeast Pacific and Great Oceans).

Ocean ‘Adventure’

NWA, the PAA, points out that around the world air cruises are coming more and more into the forefront. NWA now offers two such “Adventures” during the tourist a choice of first-class or tourist flights.

United Air Lines, serving the Hawaiian Islands from San Francisco and Los Angeles, anticipates a 15% passenger increase over last year's summer season. UAL's well-known Honolulu service has approximately 20,000 reservations on file for the 1956 season.

Worthy notable sums now total more than 1,000, three-quarters of which are made accommodations, on flights departing from Los Angeles as well as San Francisco. UAL has found that heavy traffic has warranted second airlines to be opened. During June



NEW **UIAF** downed linking network via display variety of different corruption problems, including IIS approach (IIF) and GET inherent (IUI). Configuration, use of several order considerations, displays information carefully, shows on line or more information.

Instrument Design, Part II

USAF Goal: More Data, Fewer Instruments

By Philip J. Kline

Daytime-USAF's analysis now looks in cockpit instrumentation was to eliminate 25% of the instruments a pilot must use, yet provide more information in a few much easier to read displays (AW Feb. 25 p. 62).

To accomplish this, the Wright Aeronautical Development Center's Flight Control Display Integrating Working Group has launched a basic study into just what information a pilot needs and how this information can most effectively be presented and displayed.

Basic Categories

Like navigation information which is displayed in both text and pictorial form on both the seven different instruments, USAF studies showed that all navigation information falls into one of the following four categories:

- Displacement from a default course.
- Leading indication to a known position, either fixed or moving.

When reduced to these funds

ments, it became apparent that even the most complex military logistical problems could be presented and solved in a transportation problem. This has led to a single integrated variable horizontal situation display to contain the information now presented on four or more individual instruments. The single horizontal situation display, which bears a close resemblance to instruments developed earlier by Collins Radio and Sperry Gyro, will replace

- Radio magnetic indicator (RMI)
- Vertical pointer of ID-249 compass indicator, which shows display (Lana, VOR, or long/short on-course information)
- Tansa/DMSE type distance indicator
- Cyo compass (magnetic heading)
- Data link compass indicator

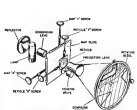
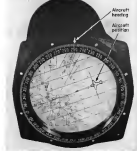
Collins and Spurr are developing slightly different versions of the non horizontal structure display and its associated computer for WADC evaluation next spring.

increase the sensitivity of the

proposed downward look display, consider an ILS (instrument) approach and a CCI (ground controlled intercept) problem. (See photos above.) The instrument skidion display at the center of the instrument represents on-sky, and the moving compass and shows the plane's magnetic heading, both relative to the skidion display and a non-kidion base or index.

• **Instrument approach:** The white (center) bar corresponds symbolically to the position of the ILS localizer beam relative to the runway. The bearing pointer (white arrow) along the periphery shows the bearing to a Tower, VOR, or other ground aid. Distance to the runway is displayed in digital values in the small window

As the aircraft approaches the landing beam, the white bar moves closer to the runway's uplight on the tarmac. When the pilot turns onto the localizer, the white bar aligns itself with the runway's uplight's localizer arm. Thereafter any deviation of the uplight from the localizer beam will cause the bar to



AIRPLANE position and heading relative to terrain will be shown on augmented charts display by perspective or closed-circuit TV techniques on small cockpit instrument shows. Movement of airplane relative to terrain will come movement of augmented chart shows to increase altitude, operating from signals generated by an automatic chart-revolving computer or other navigation aid. Chart is reloaded from slide.

Don't be afraid to ask for help.

• **Global controlled intercept:** For a GCI problem, the bearing indicator (white arrow) points to the target, assisted by signals transmitted via data link from a ground radar computer. The white cone bar displays the target's track, with the bar moving toward the intercept airplane as the point of interception is sought.

Coastal Display

When the horizontal stimulus display is monitored continuously the pitch of the horizontal carrier stimulus display (AW 1022) is 625 Hz throughout the night, the planned introduction between the two becomes apparent. In addition to the personal description of horizontal-line perception of all motor-cueing displaying information affected by changes in complex pitch angle, there is a corresponding vestibulo-ocular coordination between the turn steering reaction on the pitch and bank display, the rudder and ball turn indicators, the engine speed indicator, and the lower aft view of the navigation display in the old motor-cueing indicator.

When the airplane is entering good the steering command called for by the flight director, the control system, or GCI, the rotated steering nozzle will be angled with the line passing down through the plane's magnetic heading indicator and the mainstem engine as the lower reference.

(This gives what Capt. R. C. Robinson, in his June 4 column in *American West* called a natural procedure system with attendant-type displays in a home



INTEGRATED horizontal-vertical loss of revenue results from new USAP panel layout.

projected in color from a small glass slide onto a 7 or 10 in. diameter screen at a cockpit indicator. A 3 x 4 in. glass slide can accommodate a map of the entire U.S. The slide is so designed so that any desired portion of the map can be projected with two or more degrees of magnification for close-up or large area scrutiny.

Superimposed on the projected chart is a miniature replica and grid whose heading relative to the chart is continuously and automatically controlled to reflect the heading of the actual airplane. (See photo, p. 49.) Viewpoint of the airplane along its flight path, as established by a dual recording computer or other navigation device, will cause movement of the indicator's miniature airplane across the chart.

A prototype model which Avro is building for WADC evaluation will permit other movement of the miniature airplane over a fixed chart as movement of the chart under a fixed

transmission, replacing its cable WADC is developing, which type presentation is superior.

• Closed circuit TV system

Here the glass slide at the chart is projected optically onto a small TV camera instead of directly onto a cockpit indicator. The TV camera will transmit feed a cathode ray tube type indicator. This permits the map to be displayed on the same (CR) used to display radar fire control and navigation information, superimposing radar and chart information where desired. Another advantage is that the projection system can be located away from the crowded cockpit. Disadvantages are the added weight and black and white presentation. Avro, which also is developing a TV map display system, estimates that its production the system would weigh no more than 45 lb. A prototype is scheduled for early delivery for evaluation by WADC's Weapons Guidance Laboratory.

WADC has looked down the path

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Avro Aircraft's broad and diversified range of advanced aeronautical design projects gives engineering people unusual and opportunities to utilize individual ingenuity, initiative, imagination and creative qualities.

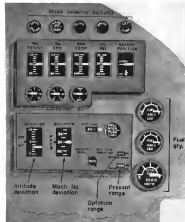
All aspects of Engineering at Avro employ the most up-to-date scientific techniques and modern facilities. There are under the guidance of some of the world's finest engineering talent. As members of a progressive Avro team, you can control your job responsibility, receive more recognition for individual ideas and accomplishments.

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TORONTO, CANADA**



AVIATION WEEK, July 18, 1956



NEW USAF panel that display radar information employs five large instruments with variable scales which are automatically graduated to desired range of values for any particular flight mode. Pilot then adjusts controls to keep all pointers centered on scales. Deviation from optimum course altitude or Mach number is shown on lower instruments.

RADAR NETWORK PERFORMER

The AVRO CF-100, with its superior command, search and fire control system is the most potent radar defender operating with the North American continent's Distinct Early Warning and other Radar defenses.

Continuous development of the AVRO CF-100 through new variants indicates its capability and versatility.

The current model-flying Mark 2 is providing improved bomber interception performance at higher altitudes.

CF-100 will also be supporting SCAR (NATO) operations in Europe. It's going to help meet the Continent's night fighter, all-weather defense requirements.

AVRO AIRCRAFT LIMITED

MILTON, CANADA

WHILE, A. V. RO. CANADA ENTERS & TO HAVE SECRET GROUP



BOLLATANKER by Goodyear being towed away to construction site after being filled from collapsible FULFLOE TANK brought in by truck. Early Boll-Tanker holds 750 gallons of goodyear Fulfloer tanks by Goodyear have capacities up to 10,000 gallons, while "polly" weighs only 180 pounds!



FUEL CELLS are tested in Goodyear and 20,000-square-foot by two self-sealing tanks at Goodyear's test facility at Wright-Patterson, Ohio. Here, jet fuels can be subjected to temperatures of -100°F, tanks can be tested for vibration and "static" encountered in combat flying.

Meeting the challenge of handling fuels

How Goodyear is finding new ways of keeping inflammable liquids on the move and under control—in the service of Aviation, Industry and Defense

The challenge of handling explosive-prone liquids is one Goodyear met in 1924, when it developed the first successful bullet-proof fuel tank for airplanes.

Since that time it has delivered a host of advancements to meet the needs required of handling new fuels for new uses.

Just among these have been new systems for

supplying highly hazardous propellants to missiles and rockets, new means for transporting and supplying gasolines to farms and remote construction sites, new oil-keelable cells for storing fuel within the thin wings of jet aircraft.

Today this pioneering continues with full vigor as the Aviation Products Division of Goodyear uncovers new ways to provide foolproof fuel systems for military vehicles, torpedo boats and high-speed jet aircraft—new concepts for delivering inflammable liquids where they are needed with maximum safety and economy.

The facilities for this research and development, in Akron and Los Angeles, represent a vast investment—the key to unlocking knotty problems concerning the adverse effects by vibration, extreme temperatures and other hazards on new and complex fuel handling problems.

It could well be that the experience of the men who man these facilities could advance the completion dates of your project by months—if your problem is tough and their handling. For information, write:

Goodyear, Aviation Products Division, Akron 26, Ohio, or Los Angeles 54, California.

GOOD YEAR
AVIATION PRODUCTS

GOOD YEAR is a registered trademark of Goodyear Tire & Rubber Company, Akron, Ohio.

What's special about these couplings?

Look at the newest couplings for jet aircraft fuel air ductwork! Connect them, disconnect them—again and again—they remain tight and dependable. Trouble-free performance is a result of radial to axial seal, with no secondary sealing devices or components. No loose parts to get lost or damaged.

Janitrol couplings save up to 40% in weight over conventional designs, yet they're designed for continuous use at 250 psi at 750°F. To make installation easy, clamp tightens on leading side; quick connects and disconnects can be made in hard-to-reach locations! Leak test torque is only 35 in. lbs.

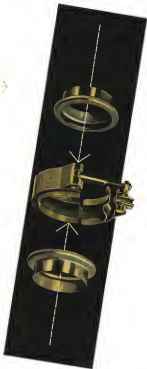
They withstand corrosion, pressure, temperature, impact, misalignment, and vibration. Maximum design leakage is .01 cfm per inch of steel diameter.

Seven sizes available now, from 1½" to 4½" special sizes and designs made to order.

Janitrol aircraft couplings are a product of experience in aircraft air handling dating back to World War II. For full details and specification data write or phone your nearest Janitrol representative.

Janitrol Aircraft-Automotive Division, Surface Combustion Corporation, Columbus 16, Ohio . . . District Engineering Offices: Washington, D. C.; Philadelphia, Colorado, Ft. Worth, Hollywood.

CONNECTIONS: NEW UNIFORMS—FURNISH CO. (L)



ion of displaying present information into three categories of instruments:

- **Power group**, consisting of power shaft, power rpm, exhaust temperature, oil pressure and waste pressure, among others.
- **Course control**, for indicating optimum altitude or Mach number for optimal range or endurance.
- **Fuel management**, showing fuel remaining.

For power group functions, it is desirable to show the pilot his actual engine conditions and the desired, or optimum, values. The display of these two parameters is made more difficult because the optimum value will change with different operating modes during a mission.

Powerplant Display

To display power group functions, WADC plans to use rectangular instruments. A moving pointer will show actual performance. Also desired, is 50). However the scale against which this pointer works will itself be variable. This scale will be automatically set for the proper range of values during each phase of a mission: engine start, takeoff, climb, cruise, and let-down. (In posttype words, the modes will be selected manually by means of push buttons.)

When all five powerplant parameters are at their desired values, all five pointers will be aligned in a horizontal string. Deviation of any one pointer from this horizontal string will alert the pilot that something is wrong.

Signals to set the instrument scales will come from electronic computers. Two experimental engine data computers are now under development for WADC by General Electric's Aircraft Instrument Department and Sperry Corp.

Underneath the rectangular instruments WADC proposes to mount three small circular gauges—side indicators to show power shaft rpm, and exhaust temperature. In addition to giving the pilot total type information, the small circular instruments will serve as standby units in the event of failure of the seven-inch primary indicators.

WADC has let contracts to Norden Kottu and Witter to develop the new engine instruments.

A computer under development by John Edgar Manufacturing Co. will calculate optimum altitude or Mach number for obtaining maximum range or jet altitude (AW April 5, p. 32). The computer's output will be the display of two rectangular instruments mounted below the power group. (See photo, p. 36.)

Optimum range can be obtained



SPACE SAVING is crowded cockpit panel is major advantage of new USAF instruments. Top photo shows conventional panel of new USAF fighter bomber. Below it is shown same panel with substitution of new instruments for old, saving available space by 50%. Photo shows need for redesign of instrument switch, control for its space gain.

under either of two conditions:

- **Varying altitude** while maintaining constant Mach number or . . .
- **Varying Mach number** while holding constant altitude.

Mode of Operation

The pilot will select the desired mode of operation, then get an indication of his deviation from the desired altitude or Mach number by means of a moving pointer.

The pilot can act in the airplane's disposable load (altitude, speed, etc.) area where the computer will calculate the maximum possible range (if load were released) and the range based on current operating conditions. Both will be shown on small digital counters. If the present gauge figure shows the

pilot can not reach his target, he may decide to dispose of part of his load to clear his target.

Small circular instruments, containing pointer and digital-counter type indicators, will display fuel quantity, remaining in individual tanks and the collective total.

Other Goals

Although WADC's primary emphasis has been directed toward integrating light and powerplant instruments, it plans to attack other weaknesses cockpit design presents, including time functions, in time-to-target capability, to target, to landing, together with a variety of weapons readiness and control functions.

WADC personnel emphasize that

Almost every modern airplane relies on Koehler quality

... in fuel level control valves

For inflight refueling and fuel transfer applications.

... in filters and strainers

For the fuel, water and oil systems of most advanced modern aircraft.

... or in drain valves

A wide range of ball or poppet types engineered to individual fluid or application requirements.

Koehler, a pioneer in aircraft valves, filters and strainers exclusively, manufactures nearly 500 different aircraft products. Its affiliation with The New Britain Machine Company greatly expands Koehler facilities. Your inquiry and parts will receive prompt attention. Koehler Aircraft Products Company, Dayton, Ohio.

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AIRCRAFT TUBING

GOVERNMENT SPECIFICATION TUBING IN STOCK

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the automatic configurations illustrated are experimental. Sensors and flight tests during the coming year may dictate changes. However, to give a graphic demonstration of the upcoming possibilities WADC has superimposed on official cutaways of the new aircrafts over the cockpit panel of a USAF fighter bomber. Nearly 10% space saving. (See photo p. 55.)

It also illustrates switched space utilization in the unswitched portions of the panel.

Of equal importance, from a human engineering viewpoint, is that the new integrated frames of software, one horizontal and one vertical, would reduce a configuration of individual frames of reference.

Flight information would be presented to the pilot in terms of actual and desired performance, relieving the pilot of much navigation, interpretation and conversion of flight data he must now perform.

Moving Tape

Reborders of instruments will be enhanced by the use of moving tape scales which can provide an required degree of accuracy, readability and design values for all particular type aircraft.

From the standpoint of size, individual portions of the integrated display can be substituted for existing instruments, gauges without affecting the overall ability of the entire panel display.

The integrated display program has modern transducers selected and its integration among both software and its instrument company engineers, according to this statement issued by WADC's Instrument Branch. Flight Control Laboratory, Instrument division, whose activities have long been concerned by the organization that are now maintained by the latest configuration of its professional, can now interface their design against.

FILTER CENTER

Standardized MTI-Racet gives in moving target indicator performance and reliability into dual Route Air Development Center to standardize on one or two design provide MTI as government furnished equipment to its major contractors.

New RTCA Standard-Minimum performance standards for airborne radar receiving and detection finding equipment operating in the 200-415 Mc band, prepared by Radio Technical Commission for Aeronautics, is now available in a 41-page report. The report, identified as Rpt. 33-56/DO 70, prepared by RTCA Special Committee

EA, is available at 36 cents per copy. RTCA's address: Room 210, 1401 T.S. 10th & Constitution Ave., N.W., Washington 25, D.C.

Looking For Basement—Rome Air Development Center is adding additional potential contractors for its source files GE-4000 companies in the electronics field, such as 600 have registered. If more firms are interested, let us know, contact Lt. & D. Hines, USAF RCHS Rome Air Development Center, Rome, N.Y.

New Telemetry Band—Consolidation is beginning to lead in the present 215-215 Mc telemetry band that the USAF is seriously thinking of moving to a new band in the 1,300 to 2,800 Mc region.

Tacit Data Link—AN/ARN 35 is the designation of the airborne Tacit receiver which incorporates added portions of an integrated data link for automatically transmitting information on aircraft bearing, altitude, distance.

Ten May R & D DeLiaut—Defense Department may be impending progress on important projects. Between R & D funds derived supply of qualified technical personnel. This possibility was noted recently by Dr. Irving W. Hill, vice president-branch of Radio Corporation of America, speaking at the Conference on Industrial Research. Dr. Hill announced that the Defense Department currently has a program for R & D projects, call out low priority programs to support upcoming of limited equipment.

Archie Wark—Major Thomas D'Almeida, Jr., of Baltimore has produced the work beginning October 20 at "Archie Electronics Work" at Baltimore. This coincides with the third annual East Coast Conference on Aeronautical and "Non-aeronautical" Electronics to be held there Oct. 28-30.

Device Stores Million Bits of Information

A new miniature high capacity computer "memory," capable of storing nearly a million bits of information on a hexamethyl diene only one micrometer, has been developed by General Electric's research laboratory. The new hexamethyl diene is the heart of a cathode ray tube type information storage device that employs laser light beams between writing and read-out techniques.

The two storage elements upon which information is stored consists of a thin glass sheet in which small holes have been etched and filled with small metal



NEW GE COMPUTER "MIMORY" tube can store much more information on thin glass hexamethyl diene (center) consisting of 256,000 holes filled with metal plugs.

plugs. When the electron beam is focused on a metal plug, it builds up a charge between the plug and conducting layers deposited on both surfaces of the glass (see photo, above).

GE reports it can catch 100 holes per plug, giving 256,000 individual storage cells per square inch. Storage cells will can respond at least 10 different levels of writing beam intensity, total cell capacity can be estimated to more than 500,000 bits (256,000 times the log is the base 2 of 10).

The hexamethyl diene construction provides glass insulating barriers between adjacent cells which reportedly solves the problem of leakage or "leakage" between adjacent cells in previous tubes.

The technique, developed by GE's Dr. Harold R. Day, also eliminates problems of registration and provides an extremely rapid storage, making it suitable for airborne use. GE reports that its new storage tube could be used in order to provide TV-type display or to permit conversion of radar data for accurate bandwidth transmission.

GE Develops Voltage Tunable Magnetron

A new voltage tunable magnetron, whose frequency can be varied over a 2.5 range and which has a control electrode that permits amplitude or pulse modulation, has been developed by General Electric. The tube should find use in countermeasures, radar systems, FM communications and test equipment.



VOLTAGE-TUNABLE magnetron, in both ordinary and laboratory version, is made of metal and ceramic duct and is only about one-half inch high.

30

USAF Air Defense Command to get first Starfighters . . .

NEW GENERAL ELECTRIC J79 GIVES ADC's LOCKHEED F-104A SUPERSONIC CLIMB RATE, HIGHEST OPERATIONAL CEILING



RAPID J79 DEVELOPMENT was accomplished at General Electric through advanced engineering and test methods. The J79 went from drawings to test cell in 18 months.



"WINGING OUT" The J79 in special X-45 flight tests at Edwards AFB in late 1955 helped speed the engine's development program. Weeks before installation in Lockheed's F-104A, the General Electric J79 was ready-to-go, joined in flight.



F-104A ROLL-OUT. General Electric's Jay Werthe, Karl Burgett, Gerhard Neumann congratulate Joe Chast, Lockheed test pilot, during roll-out ceremonies at Palmdale, California.

When the first Lockheed F-104A Starfighters join the Air Defense Command, ADC, will receive an outstanding interceptor for operation at both low and high altitudes. Powered by General Electric's light-weight J79 jet engine, the Starfighter can fly as fast as a 16-inch shell. It has a "maximum ceiling" above that of any other aircraft.

These General Electric J79 features help make the Starfighter's performance possible.

- Develops more thrust per pound than any other turbojet in its power class.

- Is highly efficient at both sub- and supersonic speeds.
- Has light-weight construction for steep climb-speed ratios.
- Unique design innovations for high altitude operation.

Already in production for the Starfighter, the J79 is today being tested for still newer weapons systems—soon to be announced. General Electric Company, Cincinnati 13, Ohio.

Progress Is Our Most Important Product

GENERAL  ELECTRIC



Three Mufflers for Jet Runups

Boeing's first mobile jet engine muffler has entered tests of YF-100 launchers 25 divided at 100 yards. Device has two bell mouth entry sections that intake air in long tube to a large splitter box, 15 ft. long with small plates in its thick blast with sound absorbent material. Pratt & Whitney Aircraft Co., Gt. long approach has three covered through surrounding a perforated metal cylinder (AW May 15, p. 30). It is changed to 10 engine in 8.32. Gt. test (low) it is truck gun with shrouded shrouding on walls and 75 ft. long silencer. Will recommend near wall.



EQUIPMENT

Cartridge, Old Standby, Expands in Use

By George Chesnut

New York—An old type of auxiliary aircraft power source, the cartridge, is expanding into new, diversified uses, as American Warrenton reveals. Some airplane makers are eager to force the explosive paragraph that are often.

With few exceptions, each of the airplane manufacturers questioned said that they contemplated in some capacity to research an experimental program aimed at extending the use of CAD (cartridge-actuated device) into actual fields. (Units are also called explosive-actuated devices, and ballistics-actuated devices.)

Development Program

Hexacel Powder Company, Inc., a major supplier of the explosive cartridges, is still in the middle of a development program to make the device smaller, more unobtrusive and simpler. Response to these are in accord with given by a recent CAD development program sponsored by the Air Force and aimed out at the Tuscon-Dana Laboratory at Frankfurt, Germany for the Ordnance Corps.

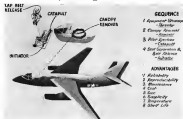
It resulted in the design and fabrication of various cartridge-actuated devices in standardized aircraft forms. With the growing acceptance and need for CAD, organizations as the American Machine & Foundry Co. have been assigned to CAD projects. AMF's Machine Research Department, in Chicago, which has its own Ballistics Research Department at Colorado Springs, has been active in the research and development for CAD used on several modern aircraft models.

Fighters to Bombers

CAD, which early have devoted from unit systems and engine starting, are being asked to do more jobs on engine-starting fighters. The device are also serving as engine start-up which cover several crew members, and are consequently taking on more complex, often multi-purpose duties. (Forms of CAD have been used for such jobs as blowing ballistics launch away from angle engine drive bombers to make sure they cleared the propeller are not in the line of explosive attachment belts to other external-carried stores.)

Current CAD applications, as noted by AMF, fall under these four categories:

- **Thrustors**, used to position crew seats



ESCAPE SYSTEM developed by American Machine & Foundry Co. uses cartridge device to trigger equipment storage, engine removal, pilot ejection, seat separation, lap belt release.



PROPOSED CAD applications by AMF are pictured in circles related to sections of aircraft.

accelerated prior to ejection, slow gear as control columns or radar beam sights away from the ejection path where they might impair a crew member, and assist the escape.

- **Reservoirs**, which contain the escape (or similar protection) structure in the proper ejection sequence.

- **Catalysts**, which open crew members from the aircraft.

- **Ballistics**, which serve in effect, as pneumatic switches to operate other CAD items such as seat separation and safety belt releases.

Because CAD has no private escape means for several crew members on a bomber, it necessarily has to perform more and more complex jobs. Among the various new requirements are that CAD maintain the possible team survival points in the plane and be several crew members. Equipment storage problems prior to ejection become more difficult because of the increased number and types of units to be moved in many different parts of the airplane.

AMF's Machine Research Depart-



Klump Clamps on Crate

For use in clamping the lid on a closed box using a Klump, a new spring steel clamp developed by North American Aviation, Inc. The device has over 100 lbs. of holding power at its end and can be reused many times. Since the Klump does not damage crates, they also may be reused. The fastener is easily tapped into place with a specially designed hand tool.

Recent proposals from various applications for CAD, up tank, bond and shorts (explosive) operations, emergency landing gear extension, emergency fire or hazardous procedures, fire chute re-bond and aircraft handling.

Here are additional proposals and comments—made about CAD by various aerospace manufacturers.

• **Douglas.**
Aside from the conventional CAD applications of canopy egressing, seat ejection and engine starting, Douglas sees a quantitative increase of CAD. "The Navy has a growing requirement for cartridge assistance for releasing externally-assisted seats. CAD will also be used to release internally-assisted seats because of difficulties encountered in obtaining proper release with high speed jet streams."

• **North American.**
Experimental work on CAD for seat ejection has been continued but been under way for some time. Beginning with the F-100C, CAD is being used to eject heavily doped tanks which, when empty, tend to drag to the air plane. Two cartridge-actuated pistons on each tank, force the tank down and away from the plane.

Experimental work is being conducted in the use of CAD to start high-speed motor (jet) engines. Cartridge operation is particularly desirable when the engine is used for countermeasures because the device gives a faster start, which is important in firing rapid sequences.

North American Aviation's business

system group has done considerable investigative work in the use of CAD in connection with pilot ejection.

• **Republic.**
Generally, CAD is useful anywhere in an airplane where a job has to be accomplished quickly and with a high degree of reliability. It is the simplest power unit, never has not failed for us on a crash.

It can be put to such use, too, emergency use in blowing (low) control surfaces, including leading gear or flap or even applying brakes. By using several cartridges, CAD can perform multiple operations in releasing several gun control turret cars.

• **Convair.**
CAD has called before (aircraft-mounted device) we used it to operate admission, and that emergency rises which you have to have in a battle. However, Convair has some reluctance to use CAD because of the most recent design of the device showing a fire. Since Convair aircraft usually incorporate high pressure air systems, the company prefers to use non-flammable pressurized air to pilot while operations are going to CAD.

A few people currently under way at Convair to use CAD to get rid of open shock after ejection.

• **McDonnell.**
The company desires CAD into two categories—equipment and armament use. Under equipment use came radar storage and engine re-bond prior to ejection, ejection seat lock disengagement and harness release after ejection. Armament use includes use of explosive or fragable bolts to jettison. Fragable bolts from seats could be used to enable knowledge of ejection seats to be used in case of engine failure, external stores, pilot, and weapons release of open shock at high altitudes.

• **Boeing.**
If anyone there may well be no parallel use of CAD in future military aircraft.

Boeing did not specify any particular application.

• **Lockheed.**
Nothing of an uncommon nature is being done here with CAD currently.

• **Small, Favorable & Reliable**

"There are advocates CAD for it because the cartridge provides a lot of reliable power in a small package. AMF listed three attributes of the device:

- Performance is reliable and dependable.
- Cartridge provides a lot of power, yet is small.
- Range is readily available.
- Little maintenance is required.
- Cost is low.
- Component design is simple.

• **Operation is intrinsically successful to maintain.**

• **No significant deterioration occurs during long storage periods.**

CAD application also extend to ground stations where they are used in many diverse applications. One known use is to perform, including pilot ejection, close by track bigger and heavier vehicles.

Lightweight Seat Has Adjustable Width Legs

London—This lightweight, adjustable width aircraft passenger seat was recently developed by Messier Aircraft Systems of Montreal, Ltd., London.

One unit, a standard, lightweight two-seater, is in production. The other two-seater and high-back tourist seats are in prototype form. On all three units, leg width may be adjusted instantly to suit the passenger seat reclining.

In the standard unit, the legs are raised for the back rest and lowered, and



RETRACTABLE reclining seat is in production.



DIAGRAM shows how both seats up.



ARROWS indicate where leg adjust.

disassembly for the seat frame. The seat is supported on a rubber base.

The back can be adjusted from 15 to 45 deg. from the vertical and can be fully reclined to rest a body.

The seats may be converted into double berths when centers range from 30 to 34 in.

The double seats weigh 67 lb., and withstand 900 lb. being bent or hit, and

have been approved by the British Air Registration Board. Price is approximately \$510.

The tourist seats will be in production as a few months. The three-seater weighs 80 lb. and costs about \$625. The two-seater weighs 62 lb. and will sell for approximately \$415. Both seats have seat widths of 17 1/2 in. and a back adjustment range from 12 to 45 deg. from the vertical.



OPERATOR presses starter on Boeing 502-118 gas turbine compressor in front of B-52.

Boeing Produces New Air Starter

An improved compressed air starter unit which develops 210 in. hp. and starting large jet engines and starting aircraft propellers and air conditioning system is being produced by the Lockheed Products Division, Boeing, Arlington Co.

The unit, designed for the Air Force, is suitable for conventional jet transport operation.

The 15 1/2 in. machine is made up of a Boeing-developed, single-stage com-

pressor driven by a Boeing 502-118 gas turbine.

Design simplification over the previous Model 150-7D resulted in reducing the number of basic engine components from 15 to 7, elimination of wire cascade guide and 40 plumbing fittings in the oil system, and cutting the self-protection costs in half.

Boeing-developed floating slipper bearing chambers easily compressurize and increase bearing life and thrust load capacity at high speeds. This, in turn, removes previous speed limitations to the cartridge compressor, allowing greater efficiency and pressure output because of the higher permeable run.

Other improvements include combining fuel system components to reduce plumbing, simplification of accessory drive and bearing and seal design.

An automatic starting system also is included in the unit.

The shaft drive counterpart of this compressor, the 150 hp. Boeing 150-10C, will be used by the Navy and the Greek Petroleum Corp. as powerplants various types of small vessels.



THREE typical fast tight rivets on dog type (left), and with automatic machine, to placement rivet (center), the standard hole, and standard rivet (right) with .015 in. underflow thickness.

Self-Sealing Rivets Utilize Soft Sleeve

Rivets which automatically seal against fluid or air leaks without use of conventional sealing agents or long time produced by Precision Aviation Corp.

Called Fast Tight, the self-sealing rivets are intended for use in such structures as internal and external fuel tanks, flying boat hulls, pontoons, pressurized fuselage sections, and any other structure in which liquid- or air-tight sealing is required.

The sealing quality derives from a soft aluminum sleeve around the shank of the rivet which extrudes into the hole in which the rivet is being driven. There are three types. The dog type has an .004 in. jacket, and a standard type has a .007 in. jacket. Wash-down type has .010 underflow thickness.

Fast Tight rivets are available for standard delivery as standard or special sizes and for use in automatic drilling and mixing machines or for normal, hand installation.

The rivet series of fasteners has undergone complete laboratory testing for shear strength and fatigue and stage pressure.



EXTRUSION of soft .004 in. aluminum sleeve jacket of dog type rivet (left) is needed to white line in underflow. Extrusion of jacket in driving completely fills all hole area of hole.



PREPARATION in this cockpit infused from a crashed F-86 can be accessed to 5 psi, more than the altitude being simulated in the chamber in which it sits. Discharge in front can be replaced to simulate rapid decompression from canopy loss. Canopy will subside to slide back on rails instead of one like that as in operation F-86.

F-86 Cockpit Simulates 150,000 Ft.

A pressurized cockpit infused from a crashed F-86 simulator has been constructed by the Air Research and Development Command's Wright Air Development Center to simulate altitude conditions up to 150,000 ft.

Primarily designed to permit studies of pilot efficiency and accuracy under extreme high-altitude flight conditions and sufficient decompression, the cockpit has been modified to fit into the development center's altitude chamber. It can be pressurized to 5 psi, greater than the air pressure in the chamber and then suddenly equalized with the chamber pressure, simulating loss of cabin pressure in explosive or rapid decompression.

The loss of cabin pressure is accom-



SEAT can be tested electrically to simulate in operation for measuring a pilot's reactions.

panied by the retractor-control positioning of a 27-in. dial gauge on the front of the cockpit.

The seat simulates an ejection by using the clutch above the top of the cockpit (below, left).

Aftermath, rocket and elevator controls have been instrumented to determine pilot reaction to various high-altitude flying.

In addition, Wright scientists hope the cockpit also will permit studies of language flight problems at high altitudes, the effects of radio equipment, visual problems and the interpretation of equipment and clothing with the pilot.

From this, they hope to improve pilot efficiency through the redesign of cockpits and modifications in clothing and equipment.

Tire Cord, Seat Belt Impact Stress Studied

Ability of textile stress to withstand high-speed impact stresses in shock loadings, imposed by modern aircraft, can be increased in one result of a study undertaken by the National Bureau of Standards.

The study relates to the extremely high rates of strain experienced by airplane tire cords during fast landings.

so the shock loadings induced in the safety belts when accelerations occur and so the shock loadings induced in the fabric, shock belts and webbing of a parachute ripping open.

The study seeks to determine the effects of high rates of strain on textile materials and to relate these results to the molecular structure of the fibers and the geometry of the cords and fabrics.

Helped for results textile fibers having better impact properties.

OFF THE LINE

Engine Components Section has been set up by Auto Supply Mfg. Co., Inc., Cam, Pa., to design and manufacture aircraft fuel system components, sub-components accessories and specialized hardware. Purpose is to consolidate into one unit the problems associated with the development of such components, permit closer quality control, and increase manufacturing efficiency.

Ohio Aviation Co. has been appointed as an authorized factory dealer for Collins Radio Co. The agency is prepared to service all Collins aviation radios, navigation, flight control and communication equipment. Address: Dayton Municipal Airport, Vandalia, Ohio.

Leitch Engineering Co. has received \$14,000,000 Air Force contract for a new design, all weather instrument dod, to service main large aircraft in the B-52, C-119 and C-124. The new year will build the docks in the U.S. and supervise their erection overseas. However, how the entire aircraft except the rear fuselage and tail group which penetrate through a fabric air train.

Design, development and manufacturing activities of the Propulsion Research Corp., a West Coast subsidiary of Curtiss-Wright Corp., have been consolidated into a single Aircraft Manufacturing and Test Department. Purpose is to make it possible for the company to accept a wider range of sub-contracting projects calling for special accessory equipment.

Northwest Orient Airlines is installing Sperry engine analyzer, dual engine instrument systems, and A-12 five-axis light control system with beam coupling equipment in its DC-6B and DC-7 fleet.

Solo Aircraft Co. was recently awarded a \$2,456,617 Air Force contract for Republic gas turbine-powered ground support equipment. Called Type MA-2 gas



Everywhere you look "miniaturization" has meant progress and profit. The automobile is packed with easy ways featured. Each year more "mini" will be found through miniaturization.

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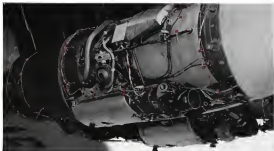


Today's telephone depends on more dependable "miniaturized" components. Better performance, reduced cost—these are the keynotes of "Practical Miniaturization."



ELGIN NATIONAL WATCH COMPANY

MICRONICS DIVISION • ELGIN, ILLINOIS



Exposed on the Boeing 7-32 are Silastic fire-retardant slippage, Silastic control rods and Silastic-covered wire bundles (clamps for testing resistance, more reliable under life as engine reaches temperatures. Silastic heat and electrical insulation housings of molded Silastic have also proved serviceable in aircraft.

SILASTIC

SILICONE RUBBER

molded parts stay serviceable at 500 F

Molded parts of Silastic®, Dow Corning's silicone rubber, show little or no change in physical or dielectric properties after long exposure to temperature extremes which would quickly ruin organic rubber. Leading rubber companies fabricate Silastic molded parts in practically any color, size or shape.

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Typical Properties of Silastic for Molded Parts

• Temperature Range, °F	-120 to 500
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• Elongation, %	150 to 400
• Compression set, % @ 100 F	15 to 40
• Hardness, durometer	20 to 50
• Dielectric strength, volt/mil	400 to 500
• Oil resistance	Dependent on type of oil

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SILICONES

DOW CORNING CORPORATION • MIDLAND, MICHIGAN



Heat Cylinder Oven

This is Northeast Aircraft's new, 35,180 cylinder heating oven which evenly heats also aircraft engine cylinders at a time. Advantage of the machine, according to NAVA, is that the convection-type oven heats all parts of the cylinders evenly, avoiding "hot spots." As it heats by a low pressure, 250,000 lbs. per square inch, a compartment above the oven. A 4000 psi air force the hot air down through vertical ducts to a manifold under the oven. The air is discharged upward through one corner, one for each cylinder. After passing through the cylinders, the air returns to the heater compartment to be reheated. Oven temperature is monitored at 100 F. Operation is automatic, a regulated conveyor moves cylinders in one end and out of the other. Capacity is 200 units per eight hour shift. The unit was built by Dispatch Oven Co., Mansfield.

turbine compressors, the 900 hp. machines will be installed in eight propeller vehicles to start large helicopter engines and to be on condition aircraft. The project was originally developed for the Navy.

Chas-Rex Corp. has received a \$13,000 order from Beech Aircraft Corp. for "bulk life" non-glass instrument lights.

The lights give even illumination across the face of an instrument and reduce glare and light spillage to a maximum through the use of prismatic light control.

Address: 2261 Elmwood Ave., Buffalo 35, N. Y.

Driscoll Aircraft Ltd. has concluded agreements with the Fokker Company, Holland, and the Societe Anonyme Belge de Construction Aeronautique (SABCA), Belgium, to manufacture under license the Bristol 100-gallon standard plastic drop tank.

First work to be made will be of a type designed for the Hawker Hunter fighter. Tanks will be made of asbestos-plastic.

ENGINEERS for absorbing problems



Aerial water absorption test. (top) - 100% water absorption. (bottom) - 100% water absorption. (right) - 100% water absorption.

For over 16 years, All American Engineering has specialized in the service of taking on tough engineering assignments for the aviation industry and the military. Key problems in the field of energy absorption — like those involved in the aircraft gear project shown here — have become a specialty.

Engineers are needed now. Because All American offers a complete engineering and development service, work assignments are rarely routine. They concern such challenging engineering problems. In the past these have ranged over energy absorption devices, jet ejection trainers, air pack up equipment and various types of air-borne weapons. Investigate for yourself the opportunities at All American.



ALL AMERICAN PROJECTS IN ENERGY ABSORPTION



Unloading water tank in the shockingly violent water absorption test. (right) - 100% water absorption.



A landing gear shock absorber in water absorption test. (right) - 100% water absorption.

All American Engineering Company
DUPONT AVENUE • WILMINGTON, DELAWARE

Trailers, Stands Designed for Jet Support

By Irving Stosser

Pasadena, Calif.—A system of trailers and workstands has been developed by Air Logistics Corp. for maintenance and support of military and commercial aircraft.

Known as the "wing system," it is standard for the Air Force, Navy and Marine Corps and is being prepared to support the following aircraft: F-89, F-100, F-101, F-102, F-104, F-105, F-16, F-47, F-57, F-58, F-8U, F-11F, F-13, F-14.

The turners and stands are used for the installation, removal, transportation, repair, and storage of jet engines and aircraft components.

Markus Keller

Under the system, tractors and standard trailer racks to pretest components and cages to be rolled from one trailer at stand to another without the expense, hazard and time involved in using a crane, hoist or slings or cranes. Rolling elements between a series cages, and component adapters and the only in the standard model 1900 trailer adapter fitted with a clamping, buckle and a drive which permits the use of a standard socket anchor or speed handle to roll the load along the rails.

Key used in the sliding system is the model 4000 A braze-dot, positioning track, used for installation and removal operations. Precision positioning of the trailer is achieved through a combination of hydraulic and reversible screw-type actuators which provide fine and off tilt rail and run. These also provide linear movement in three planes.

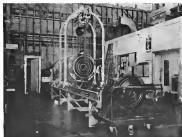
Model 3000 trainer is designed to facilitate capoeira buildup and rehearsal. It provides full deg. of rotation for ease of access.

Transport Begins

Model 7000 trailer is used for the transportation of engines and components to and from the installation area.

Model 1180 work stand is a light weight folding unit which can be used for inspection, repair, buildup and storage of jet engines and aircraft components. An elaboration of this work stand consists of two units coupled together, using an optional model 4000 rack with two engine chain hoists mounted on tracks where lift capability is desired.

Model 1500 universal component adapter is capable of handling a wide variety of shapes ranging from a 15-in diameter to a flat surface. The adapter uses a central tube on which fore and aft rollers may be adjusted to provide



MAJOR ENGINE REPAIR includes over 1700 models, stands, model 4500 valve float



123. ROLL TRANSFERRED from 4000-A trailer to 3000 trailer (right)



447031, 447032-A container trailer being used to remove HT with shadblows from T-103

ports at any two points where bulkheads in the object being copied prevent lifting. The universal component adapter is mounted on standard model 2500 roller adapters to permit transfer of the component between rolled elements of the roller system.

Engine adapters are designed to provide the link between the engine mount pads and the standard model 2500 roller adapters which rest or roll on the rails of the various elements of the analog system. That's because engine adapters have been designed to handle 95 different engine models.

Projected for inclusion in the *24* log series is a model 6800 engineering specialist trailer designed to implement current specialized maintenance and technical mobility concepts by equipping service personnel with tools, test equipment, checkout equipment, standard spare parts, and technical data in a highly mobile package. Version two which the trailer has been designed to shade electronics, electrical, powerplant, thrust control and hydraulic specialist work benches.

Sub-Critical Reactor Shown In Display

A sub-critical nuclear reactor called the "pile level" designed by a team led by the physics staff of New York University was recently destroyed in the country for the first time.

It was shown to members of the American Society for Engineering Education at the society's 64th meeting at Iowa State College, Ames, Iowa. The unit was constructed by the Atomic Energy Commission as a teaching display and was shown for the first time at an international exposition in Italy earlier this year.

The small reactor is used to demonstrate the distribution of neutron flux in the fuel and the moderator. It is also being used for research in experimental physics to determine the characteristics of a full-scale reactor having the same composition and arrangement.

The pebble herself's last consists of 164 slugs of natural venison carved in shrimpers. Each slug is one inch in diameter, eight inches long and weighs approximately five pounds. The four tiers of slugs are arranged in a hexagonal pattern.

Since the reactor does not contain sufficient uranium to sustain a chain reaction, a neutron source had been added near the center of the reactor. The source is a two curie radium-beryllium source.

Three hundred gallons of tap water are used as a moderator to slow the neutrons to thermal energy level and shield workers from the neutrons and high-energy gamma radiation.



INSTALLATION UNITS: Electro-catalytic disk w/ Cath. Made under doctor's guidance, notes.

Vertol Uses New Blade Adjustment

Automatic individual adjustment of each rotor blade's pitch will be used to smooth helicopter flight, says Vesta Aircraft Corp., Morton, Pa.

Development of an in-flight bleed stopping angle measuring device by Chicago Aerial Industries, Melrose, Ill., has prompted Vertef's interest in this refinement.

Concave being used by Vertal to replace the old-fashioned "lag" method of adjusting helicopter blade pitch angles for uniform flapping angle, the optical electronic tracker will be used in the feedback among racers in Vertal's automatic control.

The two photographs illustrate the principle of operation and appearance of the new truck. In the picture at the top, model of the air gun, the

the top surface of the box, the crossed white sticks pointing up at the hinges indicate the rotation around the axes of "vision" of two photo-cells mounted in the pick-up box, which in this case is mounted on the ground. By means of the mirrors between the two

Distances cut along the blades must be divided into the control column along with an even number of rows.

The larger picture shows the tractor mounted inside one of Vesco's H-33 helicopters for flight tests. The three seats of the tractor are mounted in the helicopter's belly underneath the rotor. The one on the left is the right one.

The photo-cells inside see the blades through an open hatch overhead. The console in the middle contains the output meter which shows a ratio 1/10 as low/high or low the blades are from the correct flapping angle. The knob below the output indicator selects the blade to be observed and the dial to the left sets the value. The switch to the right is an additional indicator, useful for example, to

Aluminum Reduction Plant for Harvey

Fluor Aluminates, a division of Harver Machine Co., Inc., Tarrytown, Calif., will build a 50,000-ton aluminum reduction plant at Tucuman, Chile.

The company plans to increase capacity of the reduction plant by 13,000 tons in 1975. During 1969-1983 it will build a second reduction plant of 67,000 tons annual capacity and a 130,000-ton alumina plant. Under an Italian-Brazil agreement, Ilva will get alumina from two Japanese companies.



CROSSING: crossed, crosses, crossing

NEW AVIATION PRODUCTS

Hydraulic Test Machine

Single test machine performs test cycle formerly requiring two Model HPA10-3H systems: performance at variable displacement pump and control up to 75 hp., hydraulic lines from 1 1/4 to 41 gpa., and pressures to 1,500 psi. Higher horsepower tests can



be made by adding a hydraulic feedback system. Means of protection and control and configuration of equipment are based on human engineering studies.

Greif Hydraulic, Inc., New York International Airport, Jamaica 30, N.Y.



Internal Locking Actuators

Internal toggle lock actuator can hold and unlock, require high external loads, and is designed to eliminate bulky external linkage used to keep landing gear and other doors locked. The actuator are designed to lock in the extended or retracted position. They were developed by the Boeing Airplane Co. and are used on the Model 707 jet transport. Manufactured in under 100 sec. They are made in four sizes from one lock up. Pressures are up to 5,000 psi.

Tog-Loc, Inc., P. O. Box 715, Bellevue, Wash.

Light, Compact Screwjacks

A three-to-one gear set of screwjacks for aircraft and missiles is available to meet individual stroke and performance requirements. The actuators have an



ten degree with double-ended splined shaft permitting two of screwjacks to drive with flexible coupling. First reduction stage is worm and worm gear combination. Later output is an Acme screwjack. Acme nut and thrusts are precision-ground alloy steel. Splined bearing and fitting components for subminiature. Operating temperatures range from -65°F. to 250°F. Southwestern Industries, Inc., Los Angeles, Calif.



Perforated Sheet for BL8

Designed especially for zinc section boundary layer control Vortexjet jet-lifted sheet used is strong, formable and free of the flanging associated with other type porous materials. This permeability is controlled by hole size and distribution. Hole pattern can be tailored for uniform or gradient pressure drop.

Sheets can be made of aluminum or other high strength metals and cut to sizes and gages for aircraft, missile, and laboratory use. Use for transpiration cooling is possible.

BLC Porous Materials Co., Division of Engineered Fabrications, Inc., 195 Lafayette St., Santa Clara, Calif.

High Resolving Transducer

Using ultrasonic echo sounding, the acoustics transducer can detect a flaw closer to the transducer transducer surface than quartz crystal and can differentiate between two defects in the same area. A sound plane flow with an area of 0.0007 sq. in. can be detected. Q1 in flaw aluminum under 1 to 4 in. thick

high modulus transducer. Quartz crystal transducer could detect flaw less than 0.1 in. from surface. Modifications are offered for special acoustic matching to the transducer.



Final being looking to an, reasonable depth, and special beam shapes. Shown below transducers up to an inch wide have been fabricated.

Industrial and Scientific Products Division, Curtiss-Wright Corporation, Caldwell, N.J.

Temperature Probe for Mach 3

Total temperature probe for measuring external aerodynamic requirements of aircraft: an instrument in appearance and construction up to Mach 3. Probe is USAF specification, Eshelby WCLJ-3-194, Amendment 1.

Probe model 1010 has a hermetically sealed stainless steel probe



thermometer element that does not weld to the very low base constant, the probe reports.

Reynolds Engineering Co., Rosemead, Minn.

Igniter for Solid/Liquid Fuels

Igniters for solid propellants or liquid fuels can also be applied to present



rotated outward. When the igniter ignites less than five grams of crystals, the igniter is constructed integrally, or larger units, the igniter has pins wires for raising a thermal in a spark.

Some types are based on special flammable plastic construction which oxidizes completely, the oxidizer ignites, leaving no residue after ignition.

McCormick Safety Associates, 25 Hill later Airport, Hollister, Calif.



Missile Sequencer

Hermetically sealed control provides automatic programming of events for wing opening of rocket pods, rocket booster extension and other functions in proper sequence.

Designed to operate under shock, temperature and vibration conditions outlined in MIL-E-1312, Procedure 1 for test stresses directly to the air frame.

Aluminum Instrument Corp., Lansing, Mich.



Vibration Tester

Model 174 shaker unit for random vibration testing of components and assemblies weighing up to 10 lb. for

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HIGH STRENGTH
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22 Spring Valley Road, Paramus, N. Y.
WEED SHOOT OFFICE: 6410 WILSHIRE BLVD., LOS ANGELES, CAL.

tor on inboard driving shaft longitudinal distance of about 4,000 rpm, bare shaft.

The 1,500-hp turbo output shifter has sufficient torque reserve, torque capacity of more than 1,500 ft. load for 100 cycles and 55 ft. load for 200 cycles. Unit weighs 2,800 lb.

Callidy Co., Waukegan, Ill.

ALSO ON THE MARKET

Flexible cutting reels. Street 2665, one lb. used at temperatures up to 680 F. It passes metal and wires at low rates; positive, zero back bite; distortion joint is about 500 F. High release is suitable in automated elevated temp. processing—Eaton & Canning, Inc., 568 Washington St., Canton, Mass.

Weak magnetic amplifier motor speed control systems operating speed of motor and applies an induction motor, corrects voltage when load conditions distort a speed change. Speed of motor drive system can be preset in non-contact 2-wire channel. Used can be attached to any standard circuit from 1/16 to 1/2 hp. used for 115 volt operation without any wiring change—CSC Laboratories, Inc., 391 Lodi St., Sturford, Conn.

Total Net System will permanently hold ten or more pieces (as a unit) and faster delivery by functioning as a net. Ruchl someone on underside of head line will multiple positive force from bearing chain has been checked. These can be set automatically at production rates on conventional cutting machines. Available in steel bars, or 1000 aluminum, in series standard styles with head diameter ranging from 2 in. to 37/32 in.—Tubule Reel & Steel Co., Wallingford 70, Mass.

"Eagle," first section survey meter, measures radiation at any angle to unit and provides readings in rads per hour. Item has photo pad, for visible detection. Readings are made by three meters, 0-2 mrad/hr., 0-75 mrad/hr., 0-750 mrad/hr. Line and portable models are available—Nursall Radiac, Inc., 575 Washington St., Newark 2, N.J.

Miniature modular pulse generator provides trace time with unlicensed or unkey. Called "Chlorophyll," it is capable of being more accurate than any other, portable or inoperative in aircraft or marine operations. It is able to withstand extreme environments and requires little maintenance. It is now being used in the production of rocket and missile instrumentation—Alconix, 30 Shattuck Corp., 608 E. St. Vincent St., Lansing 1, Mich.

Multiple view thermocouple glass provides view indicators into pressure vessels of 1, 2, 4, 6 or 8-in. diam. Glass can be used at temperatures ranging from -300 F. to 1,500 F. range of test points and pressure is determined by type of solvent used. They can be furnished with standard threads, with or without standard connections threads and apertures and protective films—Conan Corp., 7311 Sheridan Drive, Buffalo 21, N.Y.

Standard Kelco-T sheets and tape are made on one or both sides can be oriented by a variety of methods or to each. Tape is available in thicknesses ranging from .005 in. to .125 in. up to 24 in. in width; sheet is available in thicknesses from 1/16 in. to 1/4 in. and 12 x 12 in. standard sheet sizes—Kelco-T Engineering Co., 11617 West Jefferson Blvd., Culver City 40, Calif.

Superior aerospace cables, wire, pound RUD-992, can be stretch loaded to metal. Material has a cross-section diameter of 1/4 inch and can be used in aircraft up to 300 ft. in length in aircraft at rates up to 1 in. thick—Roth Rubber Co., 1860 South 54th Ave., Chicago 50, Ill.

On-line computer 49400, a 90 character symbolic material, has been developed for medical use in service up to 100 ft. with MIL-47570A gauge for interfacing aircraft instruments and MIL-47570B of the pneumatic systems to indicate equipment—Rubber Products Division, Parker Aerospace Co., 17125 East Ave., Cleveland 12, Ohio.

High torque hydraulic mixing motor, series A774, is designed for high oil use applications. Torque rating 10 in. at 1 rpm. Speeds 1, 2, 4, 6, 8 and 30 rpm in right and left hand rotation. Item can be supplied in 115 v. or 210 v., 60 cycle—Hyvex Mfg. Co., Inc., 245 East 15th St., Torrington, Conn.

Flight suit for private and business plane pilots is modeled after aerospace light suit. Adjustable sleeve and ankle straps may be tightened to eliminate wind flapping, heat and light protection—Lam Clothing, Inc., 44 Webb St., Danvers 10, Mass.

Model 8F exciter voltage regulator is designed to hold a 115V. plus or minus 1/2% RMS exciter voltage in range of 350-550 operating frequency and has an operating life of 3,000 hr. or more. It is primarily intended for 2-1 alternator systems. Overall size: 16 in. long, 5 1/2 in. wide, 4 1/2 in. high. Weight: 65 lb.—Cline Electric Manufacturing Co., 5405 West 47th St., Chicago 32, Ill.

Navy Commissions Helicopter Carrier

San Francisco—Navy's experimental first helicopter carrier, the fastest ocean carrier Theta Bay, has been commissioned after a 56-month construction at the San Francisco Naval Shipyard.

Theta Bay approaches a new concept of amphibious warfare brought about by the advent of nuclear weapons. Under a new Marine Corps doctrine of vertical envelopment, Theta Bay and others like her would launch troops in helicopters at disposal places 70 mi. from a beachhead, eliminating involved means of landing craft and beachhead construction at support steps.

1,000 Marines

Each hour 1,000 Marines can be carried by the Theta Bay, which will not run the gauntlet in the new amphibious doctrine. Eventually a carrier will be built from this lead up in an assault carrier and equipped with larger, faster types of 15,000-ton helicopter which are being built by the Navy.

Most obvious change in the Theta Bay is the installation of an elevator at the extreme aft end of the flight deck (see photo) to allow access for the large helicopters under development.

The forward center line elevator was removed, and the forward section of the canal was converted to troop berthing space; spare parts storage and shops for servicing helicopters. Helicopters are parked in the remainder of the larger deck and in most of the flight deck.

Access routes and ladders have been reconfigured to facilitate movement of troops from quarters to helicopter take-off positions on the flight deck. The original gunboat masts for airplanes has been retained, but additional masts on the deck have been changed for helicopter operations.

New external or classical masts including catapaults and arresting gear must be retained to maintain the landing deck of the vessel.

Living Space

Manufacturing changes were necessary. Vessel had to be larger, more room, galleys, additional living space and storerooms.

Cargo elevators had to be modified to bring up Marine ammunition and equipment stored below. Gunboat doctrine for Marine trucks and cars are stored forward, below decks and are carried to the flight deck by a new elevator hoist.

Island structure was reconfigured and re-equipped to adapt the joint base.



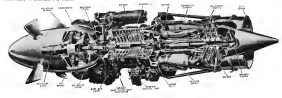
HEAVY DUTY ELEVATOR for large helicopters is installed in aft end of flight deck.



CATAPULT AND ARRESTING GEAR engines are removed at San Francisco Naval Shipyard.



SHIP TANGENT ROTOR helicopter hoist aboard Theta Bay. Modified island in background.



Napier Eland Engine

Disassembled Eland is being delivered to Napier helicopter engine test stand at 3,000 rpm, and moved at the 4,200 rpm, work in development. Napier has converted a Cooper 348 to Eland power in a demonstrator to show the ability of the engine and to have a direct standard of comparison for the performance of the Eland-Engines in against a standard 349. Company is making an extensive effort to sell the Eland as a replacement engine for other piston engines which power the majority of the world's transports.

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Engineering Ahead for a Better Tomorrow

NORTH AMERICAN AVIATION, INC.
COLUMBUS DIVISION



Biggest Airfreight Box

This essential corrugated box demonstrates the maximum size container that can be shipped in United Air Lines' new fleet of DC-8A's. The box, made by Gypsum Container Corp., measures 12 x 46 x 8 ft and has walls one inch thick. DC-8A is in the background.

Box 171, Akron, 44304; delivery and rental and standard Corrugated Aircraft 300-9977; Lumbering 300-9977; Ohio, 300-9977; 110-0700-1100; 247-3477-477.

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BUSINESS FLYING



BANK OF MEXICO 441 is a dual purpose business transport; it carries 12 passengers and has a retractable seat for pilot.

Business Plane Decoration Volume Grows

By Edwin J. Belkas

A major volume of executive aircraft interior decorating business is expected to double the income of Horton & Horton Custom Works, 311 North, Van, this year. Two years ago, the company moved from Houston to its present Mesquite Field quarters because it needed more space.

"At first, the new building was more than ample," William Horton told AVIATION WEEK. "Now we're cramped."

Since the move, the number of airplanes has more than tripled.

H&H's production record in the past 18 months: complete interiors for 134 two-engine business planes, plus a considerable number of helicopters. It does

all of the interior for Aero Design & Engineering Corp., it has completed about 100 Aero Commander's to date, including the one used by President Eisenhower, the Wiley Post-Tami Newcomb and executive jet of the Bell 47B and 47J. It is currently running five Aero Commander's weekly through its shops, with the planes coming directly from Aero Design's Bell City, Okla., factory during the course of their deliveries both prior to customer delivery.

Switch to Pines

The husband and wife team of William and Doreen Anne Horton started in the interior decorating business in 1951, opening two shops in downtown

Houston. They handled custom drapery up of automobiles, offices, hotels and boats.

Another facility at the municipal airport came to assist.

Two years ago the business grew to the point where they couldn't properly keep track of both types of operations. By then the interior bag had bitten

them and they sold the other interests and concentrated on business aircraft.

This year they expect to do a half million dollars worth of plane interiors, William Horton estimates. Since 1951 through 1955, they will have done interiors on over 500 planes, he says.

Decorating an airplane requires skills for a variety of natural and synthetic materials, which must be tested for



EXECUTIVE MODEL Bell 47B and 47J are not in H&H by manufacturer for interiors.



THE HORTONS: William and Doreen Anne.



Q8. COMPANY DC-3 has work area thoroughly separated by curtain lines and seats.



ROOMY EFFECT is provided by decorator's use of light colors in Aero Commander seats.



ARTHUR GODFREY'S LATEST: 300-450C helicopter with pale blue interior.



DM BOVE passenger seats have removable leg rest, reclining backs.

stability, lightness, and color scheme. Usually this is done by uphitting new materials to strip seat models, such as aircraft seats, which are strategically placed around the shops and office where they get a maximum of use and show, customer convenience. These seats help to determine where the materials will find their best use. Some materials cannot take continuous weight, but are useful in standing and not weight bearing or decorative surfaces.

Materials Trends

Among the new aircraft interior materials getting a heavy job at H&H is a quick-setting adhesive developed by Edwards Mining & Manufacturing Co., solid gummed leather in construction strips clamping spaces made by Lachman Leather Co., especially stored for lightness, lightweight polyurethane, by Duvon Rubber Co. to replace heavy rubber rug sections, DuPont's Nulast, a rubberized legs bar composed of twisted figure eight, used in seat construction.

Company's materials, the H&H leather, will include seating pads with the upholstery attached, headed to the cushions, flexible window frames and parts with color vinyl and belated, clamping, padding and subsequent reclining, open glass and synthetic materials for cushions and headrests that will be vacuum, fire and fade proof.

The trend in colors is to the lighter and brighter getting away from dark blue, green, brown and gray.

Price is not the best criteria for use, H&H notes. "Some of the most expensive on the best results, sometimes the converse is true."

Boomer With Gold Veins

One of the most difficult interior jobs given H&H is the interior of the Aero Commander 300-450C, a new version of the North American B-25 for the Bank of America. The assignment: a design for interior that would comfortably seat 12 passengers, with sleeping accommodations for two, and also be suitable for landing gold veins.

H&H lined up a crew of five painters, four helpers, two upholsterers, two trimmers and several detail workers. They installed the space between stringers and railings with five open glass, in some places 6 in. deep. This was covered by a blanket of similar material.

A major problem was getting the building sufficient taking up valuable space. Metal ribs were cut to size and bent into arches, no two exactly the same, and a seat to a H&H coil spring, composed to be tapered, pointed and tapered.

The design team used broadhead headrest had to be located in the arches

how faces before it fit perfectly.

Another problem was the seats. The seats installed had come from a plane used by Fleet Air. Chester Nimeth and were only a few inches above the floorboards. "We've never built the four-wheel up 13 in., the first 5 in. hatched into wood. Our first was upholstered upholstering, then a layer of light Mustang spring units individually made raised. Procop will convert the initial section of the seat."

Seats Finished

The second section started with 7 in. of upholstered legs bar 11 in. of rubber finished stock and seats were added. When completed, the seats were covered in self-padded wool with shot with stitching thread, with overhanging material cushions and headrests of dark blue gummed leather.

Coming seats with leather in on H&H specialty, employing what it knows "time chambers." Clockwise on the vertical rows of pulled leather faces.

ing the backrest. These are made by drawing back on the leather and its madder backing, the back on the seats closer spaced than on the leather so that when they are sewn together the leather pulls out. Into the pull, or channel, specially formed fingerpadded cotton is married.

Five of these seats went into the cabin, each having individual organic motifs and patterns. Two upholstered leather-covered wall tables fitted under the windows, which were framed with beak wood, padded and leather covered.

Into the fourth bay area went an upholstered covered wall for gold stone age. The sleeping berth fit above the seats. A hand-drawn draped seat between the sleeping lounge and flight deck and another for passengers.

The interior decorating firm also does a good business in selling its special seats and other color fabrics, in colors and combinations, to customers custom. It has given up doing painting, upholstery and job and to specialists.



Piper Flight Tests New Comanche

While number one Piper PA-24 Comanche for place business plane is flight tested at Lock Haven, Pa., the number two airplane is being compared in unique extensive field service trials. The testing has largely closed out the Comanche's better production and also to have approximately 500 additional personnel by year end for this project. PA-24 production began late this year and will hold at a rate of about one a week into early 1955, then will increase to two planes a day.



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Unicom Units Link Oil Rigs, Aircraft

Seaboard and three-based Unicom units provide a much-needed communications net work for The Collins Co. in its widely scattered offshore oil drilling operations along the Southern Louisiana coastal waters. The operations are serviced by two Sikorski S-55 helicopters, two Cessna 440 Skyhawks and a Cessna PWE 44, amphibian.

Recently, a complete FM installation was made, but it was soon found impractical for handling both for aircraft and service boats, so the company installed 11 National Automatic Co. VGTB 2 Unicom units and on offshore heliports radioed its aircraft in. One drilling unit is 70 mi. offshore. The Unicom is providing solid ground-to-air communications to the helicopters flying at 200 ft. shortly after leaving other units. The VGTB 2s are located in the drill rig pilot houses and the antennas are on the pylons. The standard two-way radio system was modified to vertical polarization using the horizontal section for ground plane. The company's aircraft transmit and receive on 123.4 ft. frequency.



Aft Oil Tank Locations Checked by CAA Agents

Installation of oil tanks in baggage compartments of open front Seaboard Model 75s are being checked for proper installation and effectiveness by Civil Aeronautics Administration agents, news agency.

The installation, noted during a recent CAA inspection trip, is the subject of a general ban on maintenance on no-schedule.

Actual applications using this method has shown that a possible exposed oil coating over the airframe surface, less leakage, better e.g. conditions and easier servicing.

CAA feels that there is a possibility of oil staining during engine starting and shutdown when the oil supply is low, used for monitoring the oil level for water operations and that the installation often is found to be in a state of a tank.

A number of operators claim that they have been using the installation successfully for years.

The CAA recommendation outlines procedures for the agent to check on these installations. Included are a ground test with the engine in low, used for monitoring the oil level for water operations and that the installation often is found to be in a state of a tank.

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SPECIAL CESSNA PWE boat detector unit of magnetometer for seabed survey.

Magnetometer for Small Aircraft

A new lightweight magnetometer, noted for installation in small single engine aircraft, is being used by Hyson Aerial Services, Inc., Pasadena, Calif., to provide low-cost aerial prospecting service for small mineral and oil companies.

Hyson has installed the small Vane unit magnetic magnetometer in their specially modified Cessna 440 powered by 400 hp P-W Wap Jr. engines in place of their standard 300 hp. levels.

The extra power also permits operation at approximately 54,000 ft. for support work.

When used for geophysical survey, the PWH are also equipped with a digital push-pull recorder for transmitting data to the magnetometer displays. 35-sec. spotting camera and radio attachment for transmitting an accurate track.

In addition to mineral hunting, the magnetometer equipment also spots iron, lead, copper, zinc and other deposits. One Cessna is now conducting aerial surveys in Alaska, Hyson reports.

The small sensor from operator 11 applies throughout the world, including two converted Lockheed F-30 fighters for high altitude photo missions and a Cessna PWE 440 carrying over a ton of electronic detection gear including a magnetometer, amplifier and electroencephalograph.

PRIVATE LINES

J. C. Woodcock of Fort Worth, Tex., after manager of the Texas Division of the Bell Aircraft Corp. was the first pilot to land on Houston's first rooftop heliport on the Texas Two Parking Garage. Woodcock flew a Bell helicopter, the 40G-3.

Aircraft and dollar volume shipments by Beech, Cessna and Piper for June Book, 61 civil planes valued at \$2,498, 612; Cessna 292 aircraft valued at \$3,612,122 and Piper 200 planes valued \$2,016,452—\$1 dollar volume being better billing price. Through June these firms have delivered nearly 5,600 business and hobby planes during a

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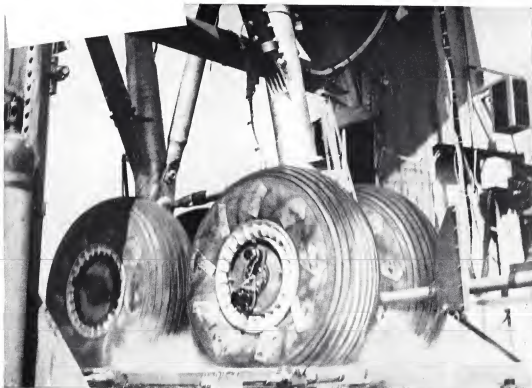
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